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THE

JUNE, 1927

METAL INDUSTRY

WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW

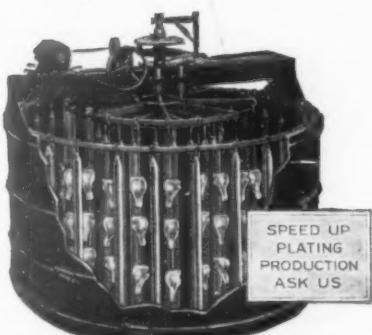
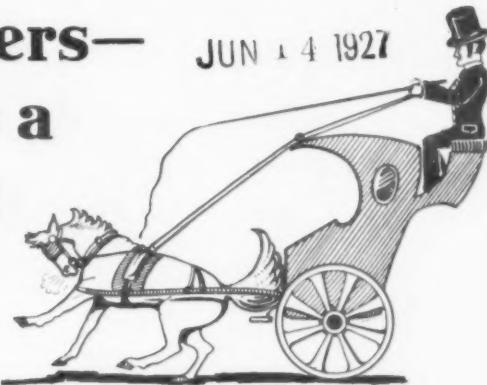
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THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW

Vol. 25

NEW YORK, JUNE, 1927

No. 6

Electro-Platers' Convention in Toledo

Advance Information and Plans of the Fifteenth Annual Convention in Toledo, Ohio,
June 29-July 1, 1927

Written for The Metal Industry By F. J. HUNTLEY

Toledo, Ohio, is preening itself these days in preparation for the annual convention of the American Electro-Platers' Society which opens on June 29 and continues until July 2. The headquarters of the convention will be at the Hotel Secor.

OFFICIAL PROGRAM

Wednesday, June 29.

- 9:00 a. m. Registration and renewing of acquaintances.
10:00 a. m. Meeting of executive board.
11:00 a. m. Meeting of credentials committee.
11:30 a. m. Trip to plants.
3:00 p. m. Convention called to order, by chairman, Henry Schuld, Toledo.

Address by Lester Cope, secretary of the Toledo Branch.

Response by past-president E. J. Musick.

Addresses by Charles H. Proctor and F. C. Mesle.

Reading of minutes; reports of officers; appointment of committees by Supreme President; reading of resolutions.

8:00 p. m. Educational session.

Thursday, June 30.

- 8:30 a. m. Educational session.
1:30 p. m. Trip to DeVilbiss Manufacturing Company.
8:00 p. m. Educational session.

Friday, July 1.

- 8:00 a. m. Boat trip to Put-In-Bay. Sessions on boat at 9:30. Dinner on the Island, with water sports afterward; ball game.
6:00 p. m. Return to Toledo; buffet supper on the boat.

Saturday, July 2.

- 9:00 a. m. Business session; reports of committees; election of officers; selection of convention city for 1928.



HOTEL SECOR, HEADQUARTERS.

- 1:00 p. m. Sight-seeing trip through the city and around the historic Maumee Valley.
7:30 p. m. Banquet. Installation of officers; awarding of prizes for papers; entertainment and dancing.

Besides the above, arrangements have been made for entertainment of the ladies. This will include luncheons, a bridge party, a shopping tour and a theatre party, with other pleasures added.

PAPERS TO BE READ

Wednesday, June 29, 8:00 p. m.

NICKEL ANODES. George B. Hogboom, Hanson and Van Winkle Company.

THE CHROMIUM SITUATION FROM A PRACTICAL STANDPOINT. E. G. Lovering.

INDUSTRIAL CLEANERS. P. J. Benoliel, International Chemical Company.

LACQUER. Dr. R. Reeves, Waukegan Chemical Co.

Thursday, June 30, 8:30 a. m.

ELECTRICAL ENERGY IN THE PLATING ROOM. Floyd T. Taylor, A. P. Munning Company.

CHROMIUM PLATING. C. Van Deran, Westinghouse Electric and Manufacturing Company.

OXIDIZING AND ETCHING OF METALS. Frank Loeb, New York.

SOME ODD COLORING ON METALS. T. A. Gardner, New York.

Thursday, June 30, 8:00 p. m.

RECENT ADVANCES IN THE COMMERCIAL ELECTRO-PLATING OF CHROMIUM. Charles H. Proctor, Roessler and Hasslacher Chemical Company.

CLEANERS AND CLEANING. John A. Carter, Oaktite Products, Inc.

A SUMMARY OF RESEARCH ON ELECTRO-DEPOSITION AT THE BUREAU OF STANDARDS. Dr. William Blum, Bureau of Standards.

A PROGRESS REPORT ON THE INVESTIGATION ON SPOTTING OUT. W. R. Barrows, Bureau of Standards.

METHODS OF CHROMIUM PLATING. H. E. Haring, Bureau of Standards.

APPLICATION OF CHROMIUM PLATING. Dr. William Blum, Bureau of Standards.

Friday, July 1, 9:30 a. m.

RESEARCH DEVELOPMENT AND STANDARDIZATION OF FINISHING PROCESSES AND METHODS. C. Van Deran, Westinghouse Electric and Manufacturing Company.

CHROMIUM PLATING. J. K. Preston, Hartford, Conn.

Madison. Single, without bath, \$1.50; with bath, \$2.00 and up.

Navarre. Single, \$1.25 and up; with bath, \$2.00 and up; double, \$2.00 and up; with bath, \$3.00 and up.

Boody House. Single without bath, \$1.50 and up; with bath, \$2.00 and up; double, without bath, \$2.50 and up; with bath, \$3.50 and up.

Antler. Single, \$1.50; double, \$2.50.

Monticello. Room, without bath, \$1.50 and up; with bath, \$2.50 and up.

Michigan. Room, \$1.50 and up. All with bath.

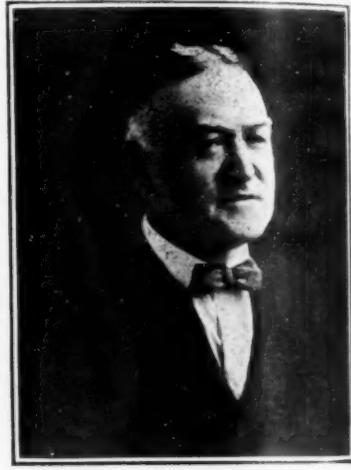
Officers of the American Electro-Platers' Society



F. C. MESLE,
President.



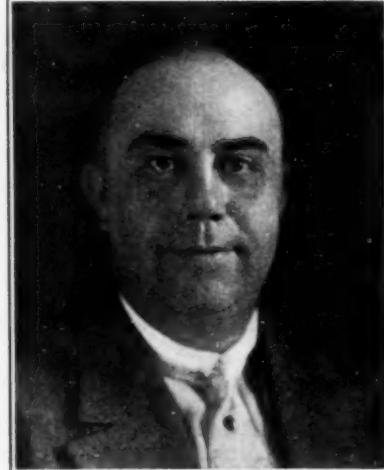
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1st Vice President.



JOHN H. FEELEY,
2nd Vice President.



GEORGE GEHLING,
Secretary-Treasurer.



F. J. HANLON,
Editor, The Monthly Review.



E. J. MUSICK
Past President

HOTELS

The following are the leading hotels, and their rates:

Secor. Single room without bath, \$2.50; with bath \$3.00 to \$5.00; double without bath, \$4.00; with bath \$5.00 to \$7.00.

Commodore Perry. Single, \$3.50 to \$6.00; two persons, \$5.00 to \$7.00; all with bath.

Waldorf. Single room without bath, \$1.50 to \$2.00; with bath, \$2.00 and up; double without bath, \$3.00 and up; with bath, \$4.50 to \$7.00.

Fort Meigs. Single, \$2.50 and up; double, \$4.00 and up. All with bath.

Lorraine. Single, \$2.50 and up; double \$3.50 and up.

Park Lane. Single, \$3.50; double, \$5.00. All with bath.

Toledo. Room, \$1.50 and up.

MANAGERS OF THE CONVENTION

The convention will, of course, be presided over by F. C. Mesle, Supreme President. The other officials are Robert Steuernagel, 1st Vice-President; John H. Feeley, 2nd Vice-President; George Gehling, Secretary-Treasurer; E. J. Musick, Past President; F. J. Hanlon, Editor of The Monthly Review.

The committees in charge of the various activities, of course, have their arrangements already completed. The

chairmen and members, who are listed below, will be on duty throughout the convention at the Hotel Secor.

Educational and Publicity.—John Stein, H. L. Myers and James Lee.

Hotels.—James Nagle, Edward T. St. Arnaud, Walter Weiker, Nicholas Keifer and William Whitaker.

Banquet.—W. W. Weiker, James Nagle, N. Feifer, Edward T. St. Arnaud and Thomas De Christopher.

Reception.—Frank Pierce, Louis Bogner, D. P. Ryan, Henry Wandke, Charles Suyder, Walter Wolinski, James Lee, Joseph Fagan, John Hilfinger and Willard Schuller.

EXHIBITORS AT THE CONVENTION

Charles F. L'Hommedieu & Sons Co., Chicago, Ill.

Hanson & Van Winkle Company, Newark, N. J.

Yerger Manufacturing Company, Fremont, O.

Frederic B. Stevens, Inc., Detroit, Mich.

Egyptian Lacquer Manufacturing Company, New York.

Maas & Maldstein Company, New York.

Oakite Products, Inc., New York.

International Chemical Company, Phila., Pa.

Belke Manufacturing Company, Chicago, Ill.

The J. B. Ford Company, Wyandotte, Mich.

Matchless Metal Polish Company, Chicago, Ill.

Apothecaries Hall Company, Waterbury, Conn.

HIGH LIGHTS OF THE CITY OF TOLEDO

Toledo, it should be remembered, is contending in the industrial world with Buffalo, Cleveland and Detroit. It is noted for its varied industries, which give it a commanding position so far as maintaining business is con-



WILLYS-OVERLAND COMPANY, TOLEDO, OHIO.

cerned. If the motor car trade slows down to any extent Toledo is not stagnated, as its other industries sustain it. So to-day, Toledo has nothing but good reports to make so far as its general business is concerned.

From a pleasure standpoint it is like many of the other lake cities. It has access by water to a number of summer playgrounds. It lies on the Maumee Bay, a part of Lake Erie at the head of the picturesque and historical Maumee Valley. During the summer months and until late in the fall, lake steamers give the visitor an opportunity for refreshing trips. A few miles away



PLATING PLANT OF THE DURA COMPANY, TOLEDO, OHIO.

out in Lake Erie is Put-In-Bay Island, made famous by Commodore Perry, during the war of 1812. One of the most important marine battles during that struggle was fought almost in sight of Toledo.

Toledo is also an art center. Its collections of paintings, Egyptian antiques and glassware are famous the world over. Thirteen beautiful parks are maintained. Also, there are three public golf courses and in addition, seven private ones. Then there are five yacht and canoe clubs, which also afford excellent diversion for visitors.

When it comes to transportation, probably no other city in the country can point to anything better. It is due to this fact that Toledo is so prominent as a manufacturing center. Seventeen main rail lines and seven branch lines, reaching out to all sections of the United States, radiate from this bustling town. One hundred and sixteen express trains enter and leave Toledo each day of the week. Added to the rail lines are the shipping lines. Great Lake freighters and passenger steamers are leaving the Toledo docks almost constantly during the navigation season. More than 14,000,000 tons of coal were shipped from Toledo docks during last year. This fuel comes into Toledo from the coal fields of Pennsylvania and other sections and is then loaded onto lake freighters for transportation to the west and northwest.

More than 700 factories are engaged in turning out 1,200 or more different products, which are shipped to all parts of the world.

About fifty per cent of Toledo's population are home owners, a feature that insures amicable working conditions. One almost never hears of serious labor troubles in this city. More than 120,000 wage earners find employment in Toledo, with an annual pay roll of approximately \$175,000,000.



CHARLES H. PROCTOR,
Founder, American Electro-Platers' Society.



HISTORIC MAUMEE RIVER, TOLEDO, OHIO

ELECTRO-PLATING IN TOLEDO

Toledo has a flourishing electro-plating industry which gives employment to a large number of persons. This is one of the reasons why the American Electro-Platers' Society decided to hold its 1927 convention in Toledo.

Some of the electro-plating plants and companies having electro-plating departments are as follows:

American National Wheel Company; Acme Specialty Manufacturing Company; Auto-Lite Company; Edw. N. Biddle Company; Champion Spark Plug Company; Chariot and Mills Manufacturing Company; Conklin Pen Manufacturing Company; DeVilbiss Company; Doehler Die Casting Company; Dura Company; Electric Auto-Lite Company; Gerity Whitaker Nagle Company; Gendron Wheel Company; Grob Plating Company; Hearn Brothers; Hilfinger Plating Company; Kuisey Manufacturing Company; Lober Art Brass and Specialty Company; Mather Spring Company; Meilink Steel Safe Company; Milburn Wagon Works; James E. Nagle and Sons; National Supply Company; Ranson and Randolph Company; A. W. Reiser; J. N. Biddle Company; Seiss Manufacturing Company; Smithchester Chandelier Manufacturing Company; Spanolis Plating Company; Standard Electric Stove Company; Tillotson Manufacturing Company; Toledo Chandelier Company; Toledo Cooker Company; Toledo Metal Wheel Company; Toledo Nickel Works; Toledo Jewelry Manufacturing Company; Toledo Metal Wheel Company; Toledo Manufacturing Company; Toledo Scale Company; Western Gas Fixture Company; Willys-Overland Co.

The Acme Specialty Manufacturing Company does a manufacturing business in metal mirror frames, stands and fixtures of all sizes and shapes, employing about 100



DE VILBISS COMPANY, TOLEDO, OHIO.

people. W. W. Weiker is the head of the plating department, and is also secretary of the Toledo Branch A. E. S. This company manufactures the Acme line of mirrors, doing all the work involved.

The DeVilbiss Company manufactures spray painting equipment, and is well known throughout the plating and finishing trades. Henry Schuldt is the head of their plating department.

Gerity-Whitaker-Nagle Company does a jobbing and contract business, being pioneers in their territory in plating aluminum and zinc base die castings. They employ about 150 people and at the present time are operating day and night. William Whitaker is the head of the plating department. This is the largest job plating plant in its territory. It was established thirty years ago by James J. Gerity and William Whitaker, both of whom are still active in the business. The officials of the company are James J. Gerity, William Whitaker, Harold Whitaker, and James J. Gerity, Jr. The last two are sons of the founders and have been associated with the company for seven or eight years.

Grob Plating Company, another jobbing plant, employs about 60 people, and the head of the plating department is the active head of the firm, William C. Grob. This company does a varied line of work, but has the largest

enameling department in its territory. One of the records made is the finishing of four carloads per day of Ford bumpers. The plant occupies two acres of ground and has two buildings of three stories each; one 45' x 170' and the other 40' x 70'.

Meilink Steel Safe Company manufactures fire-proof safes and other similar equipment, employing about 125 men. The head of the plating department is A. J. McCaffery.

James E. Nagle and Sons, are contract and job platers, employing from 60 to 70 people. Mr. Nagle takes active charge of the work. He was formerly connected with the Gerity-Whitaker-Nagle Company, but on January 1, 1927, he severed his connection with that firm and started his present business, with his three sons.

A. W. Reiser, manufactures electric lighting fixtures for the electrical jobbing trade. H. Wandke is head of the plating department.

International Fellowship Club

The next meeting of the International Fellowship Club will be held at the Hotel Secor, Toledo, Ohio, at twelve o'clock June 29th, 1927, in Room 528. At this meeting the proposed Code of Ethics will come up for discussion, also the election of officers will take place, and all members of the International Fellowship Club and those who are eligible are requested to attend this meeting.

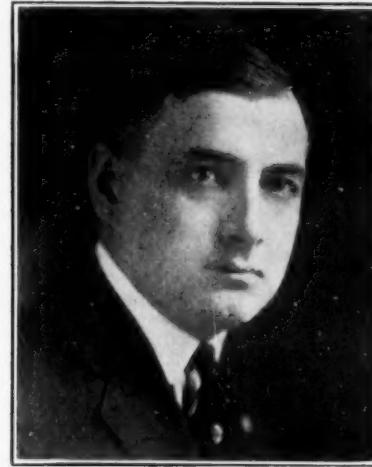
The secretary will have to make reservations for a given number with the hotel management and will appreciate it if the members will make their reservations with the secretary ahead of this meeting so that he may make proper reservations ahead of time. Communicate at once with R. J. Hazucha, care of Maas & Waldstein Company, 1115 W. Washington Boulevard, Chicago, Ill.



ERNEST LAMOREAUX,
President.



GEORGE B. HOGABOOM,
Vice-President.



R. J. HAZUCHA,
Secretary-Treasurer.

Driving a Plating Solution

By T. C. EICHSTADT

The following is a comparison of a plating solution with an automobile, given to me by a friend of mine—a chemist. I believe it will interest platers.

One heats a nickel solution in order to obtain more speed in deposition just as one steps on the gas in an automobile to gain speed.

If you are going to drive sixty miles per hour instead of 7 miles per hour, you want a mighty smooth road to be able to do it with the same degree of comfort. The index of smoothness in the operation of a plating plant is found to reside in the purity, both chemical and physical of the chemicals used in the plating solutions. Anode sludge has about the same action as a deeply graveled road. If you do not want your car all peppered up with gravel marks, you will have to drive slowly and use up a little more time.

If one can control the purity of the components of the solution, one can almost make a plating solution sit up and talk. It is a fact that a perfectly pure plating solution will not give a pitted deposit on soft or hard steel if operated at a reasonable pH value, say 5.2 at current density of either 30 or 150 amperes per sq. ft.

The instant the first infinitesimal film of nickel is deposited on the metal cathode, that instant the cathode acts as if it were composed of the metal being plated on the object. It makes no difference what the nature of the object is so long as it is clean, and has the proper relation

to the metal plated upon it in the electro-chemical series.

If one can control the contents of a plating tank, then one can always duplicate results. If one looks into the various formulae given for hot nickel solutions, one usually finds nickel sulphate, a chloride or fluoride, boric acid and sometimes magnesium sulphate in the bath.

Again let us return to the analogy of the automobile in motion. The nickel sulphate is the body of the car; the boric acid is the buffer or the springs; the chloride or the fluoride is the ignition system, that which bites into the anodes. The generator is the motor or engine; magnesium or Epsom salts, the road scraper. In the front seat behind the pH tubes, etc., at the steering wheel sits the foreman plater or chemist. The rear end and universal joint, transmission clutch and brakes might well be said to be the working foreman, tanks, bus bar, switches and rheostats; sediment and gas are certainly exhaust products. Good work, the miles traveled and bad work are certainly time lost by poor roads, tire trouble, repairs, etc.

The fact is there are a lot of people who could be compared to a plating solution out of kilter. Whenever you get copper into a nickel solution, you get a black deposit. You also get a black look too, don't you? If you ever tell a lady her dress does not look well, you get a black look too, don't you? And the queer part of it all is that it is just about as hard in both cases to get either of them into a good natured state.

Twenty-Five Years of Electroplating

A Paper Delivered at the Spring Meeting of the American Electrochemical Society,
Philadelphia, Pa., April 28-30, 1927

By GEORGE B. HOGABOOM,

Research Electroplater, Hanson & Van Winkle Company, Newark, N. J.

Electroplating, that is, the electro-deposition of metals upon either metallic or non-metallic surfaces for the purpose of adding to the beauty of an article or giving it protection against corrosion, has been discussed in at least one of the sessions of this Society at each meeting for several years. This art, while now only one of the divisions of electrochemistry, had an important part in its inception and development.

While this paper is to be a review of the advance made in the last twenty five years, it is believed opportune to give briefly a few points of the history of electroplating. The electroplater is not only required to deposit metal, but must know how to impart to the plated article colors that will make it more attractive and pleasing to the eye—there are the soft shades of medallion bronzes, the brilliant red of royal copper and the deep black of oxidized silver. The formulae for coloring metals can be traced to the first century—to the original alchemists of Egypt who were not seeking to transmute base metals into noble ones but to color bronzes to blend with gold, and to oxidize silver with a sulphide to produce a deep brilliant black which they dedicated to their goddess Anubia. The same formulae they used for coloring bronzes are still used by the French, British and American mints, in fact, the very pins which are now fastened to your coats received their color by the same process as described in ancient manuscripts.

Passing rapidly to 1839, we find Jordan in England reproducing coins and medals in copper, using a Daniell battery. This electroplating of copper upon a graphited surface of metal or wax was the beginning of commercial electrodeposition, which now includes electrowinning, electrorefining, electroplating and electro-forming of metals. During the following eighteen years electroplating changed from a parlor amusement to an industry.

The demand for better electrical conditions gave Faraday the incentive to develop the first electrical generator. This was constructed for electroplating with silver, and it was not until nearly thirty years later that electrical machines, as now known, were brought into existence.

The early investigators—Watts, Bunsen, Napier, Roséleur—successfully deposited nearly all the metals being plated today; even chromium was deposited by Bunsen in 1854, and in 1856 Guether used the electroplating of chromium to prove some of Faraday's laws. In this country the development of commercial electroplating began about 1869, after Dr. Isaac Adams perfected the electroplating of nickel. As an incident of interest, it can be related that Dr. Adams, who had been disinherited by his father because of his insistence in following electroplating investigation, had persuaded the Army Department of France to have all their small arms nickel plated. The contract was to be signed the following day but unfortunately that night the Franco-Prussian war was declared and Dr. Adams lost his job.

In 1874 Dr. Edward Weston, who worked in an electroplating shop and who recommended the addition of boric acid to nickel plating solutions, designed and supervised the construction of a low voltage generator for Abraham Van Winkle. During the following year Dr. Wes-

ton used his knowledge of electroplating in the development of his well known electrical measuring instruments.

From then on, for several years, the development of electroplating was left almost entirely to the workman—the chemist seemed to have lost interest. There were a few books published on the subject and in all of these the formulae were those of a "cut and try" development rather than of any scientific investigation.

In 1902 the writer became interested in chemistry and endeavored to learn methods for the control of plating solutions by analysis. Several of the leading chemists of the day could offer only general assistance. As far as was known there were then no electroplating establishments where the solutions were analytically controlled. Today this is a common practice. It is evident then that the most important thing in electroplating in the past twenty five years has been the introduction of methods of analysis and control of plating solutions. Upon this depended the progress of investigation.

It is probable that through the papers presented before the meetings of the American Electrochemical Society, the interest of the chemist in electroplating was again renewed as there has not been one session at which a paper dealing with some phase of electroplating has not been presented and discussed. Each year the number of papers has increased and there have been several symposia on the subject. At one of these, a valuable contribution contained the axioms of Dr. W. D. Bancroft. These, like himself, have stood the test of time!

The work of Kalmus and Savell on cobalt called attention to the possibilities of improving nickel plating. The solutions made from nickel sulphate soon displaced those that were in common use which were made from nickel ammonium sulphate. O. P. Watts developed hot nickel solutions in which high current densities can be used. M. R. Thompson has advocated the use of solutions with high sodium sulphate content. The application of the control of the acidity of nickel by the pH colorimetric method has shown that litmus, congo and troepelin papers have no value. Until recently the effect of the temperature of the solution on pH has been overlooked. A standard nickel solution having, what is considered good practice, a pH of 5.8 at 70° F. will have a pH of 6.2 at 40° and 5.4 at 130° F. The composition of the nickel anodes has changed, and where in 1902 those containing only 92 per cent of nickel and large amounts of iron and carbon and numerous other impurities, were accepted, today the demand is for 99 per cent of nickel with limiting amounts of certain impurities.

The solutions for depositing many of the other metals have undergone very minor changes. The formulae recommended in the early fifties are still used, except with slight modifications brought about by the advancement in the production of better chemicals. The only marked change has been the displacement of potassium cyanide by sodium cyanide. This was a necessity during the war and its lower price has compelled its continuance. So far no exhaustive data have been offered to show the exact comparative value of the two salts.

There has been more research work done on electroplating solutions and processes from 1917 to the present

time than in all the previous years combined. At government laboratories, universities and commercial plants many important investigations have been brought to a successful conclusion. Previous to this time the investigator was handicapped by the dearth of any reliable data. Today there are many papers in the publications of societies and in scientific and trade journals, that contain accurate information. Two books, one in England and the other in America, have recently been published and while neither is thoroughly scientific, they both have for their object the education of the electroplater and the necessary instruction for the scientist concerning commercial practice, and have suggested methods for making and controlling plating solutions.

In France, Germany, England and this country there are many investigators who have done meritorious work. It is not possible to name all of those who have contributed during the past twenty five years to the advancement of electroplating but among the names that should be mentioned are: Hughes, Field, Barclay, Dobbs and Oilard in England; and in America, Mathers, Fink, Blum, Haring, Thompson, Storey, Watts, Ferguson, Madsen, Baker, Philipps, Knox, Farnsworth, Proctor—these are but a few and there are many others.

Among the important phases of electroplating that have been studied are throwing power, control of acidity of nickel solutions, the protective value of electro deposits and methods for testing it, polarization, structure of electrolytic deposits, effect of structure of the base metal upon the structure of the deposit, value of addition agents, and simple methods of analysis of solutions. The Transactions of the American Electrochemical Society are a storehouse of information on the scientific study of this subject.

Probably the greatest thing that has happened to the industry is the formation of the American Electroplaters

Society, an organization of foremen platers who, having no technical training, have sought to increase their knowledge by meeting with each other and exchanging ideas and methods. Gradually the scientific data thus brought out are being put into practice and today many a man who cannot even balance an equation, can control his plating solutions by having learned the mechanics of analysis. The work of the Electrodeposition Division of this Society is well known. Recently in England the Electroplaters and Depositors Technical Society has been organized. This is associated with the Faraday Society.

Electroplating has advanced with other American industries and there are several large installations of modern mechanical devices that greatly increase production and decrease costs. There have been many new things, heralded as great discoveries. Some of these have long been known and are but revivals at the opportune time of processes that have been overlooked, or have failed to get the necessary impetus. Necessity for better protection against corrosion and erosion and tarnishing has provided the stimulation. Considerable credit should be given to those who have had the courage and foresight to bring out these processes. For many of these new methods extravagant claims have been made, but time will prove their value and proper credit will be awarded to those who were really the originators.

The outstanding subject of interest in the past few years has been chromium plating. It is yet too soon to predict the extent to which it will be applied, but evidently it has important possibilities. Whether these will be fully realized depends not only on the work of research chemists, but also on the ability of the electroplaters to apply these results in practice.

There is much still to be done in electroplating. We know too little about the whole subject and our knowledge concerning specific problems is very meagre.

Hot Tinning Cast Iron

Written for The Metal Industry by CHARLES H. PROCTOR, Plating-Chemical Editor

Q.—I will highly appreciate the favor, if you will give me the correct information on the process of hot tinning on cast iron parts.

A.—Successful hot tinning depends to a great extent upon the surface of the iron prepared for tinning.

1. If at all possible, the articles to be tinned should be sand blasted. This gives the ideal clean surface.

2. If sand blasting is not permissible, then the castings should be pickled in hot hydrofluoric acid solution: water 1 gallon; commercial hydrofluoric acid 24 ozs.; temperature 160 deg. F. When the burnt-in sand and surface scale are dissolved, wash in cold and boiling water.

3. Following the pickling operation, if at all possible, tumble the castings in a solution consisting of water 1 gallon; soda ash 3 ozs.; sodium cyanide $\frac{1}{2}$ oz. Some sharp sand, such as sea sand may be used in the solution as an abrasive. If tumbling is not permissible, use the solution at 160 deg. F. as a neutralizing factor for the acid in the pores of the cast metal about 5 minutes, then without cold water washing, brush the surface with a steel brush or scour with sea sand. Wash immediately, then immerse in the flux until ready to tin the articles.

4. The flux should consist of a saturated solution of scrap zinc dissolved in muriatic acid; all the zinc the acid will absorb. When the chloride of zinc solution so prepared cools down to normal temperature, then filter through cheesecloth to remove the undissolved lead (the impurity) add 2 lbs. sal-ammoniac to each gallon of solu-

tion or as much as the solution will dissolve, plus or minus.

5. Two tinning kettles should be operated; the first is the roughing kettle in which the articles are immersed; after cleansing and fluxing, always drain the excess of flux before immersing in the molten tin bath. The second tinning kettle is the finishing operation. The temperature of this tin bath should be maintained at a slightly lower temperature than the roughing kettle and should be covered to the depth of $\frac{3}{4}$ " with palm oil.

6. The articles should go directly from the roughing kettle to the finishing kettle. If they are not too large and heavy they may be cooled in paraffin oil, then dried out in maple sawdust, if necessary. If too large, they better be quenched in water to which is added about 1 oz. carbonate of ammonia per gallon of water.

Metals in Radio Sets

The metals used in the manufacture of radio receiving sets are listed and their functions described by Frank A. D. Andrea, 1581 Jerome Avenue, New York, radio receiver manufacturer. Copper is used for wiring and shielding; brass goes into condenser plates, nuts, screws, eyelets, rivets, pins, screw machine parts of various sorts; bronze into ornamentation; aluminum for die cast brackets, and punched press parts for condenser plates. Some of the moving parts of speakers where lightness is essential are made of aluminum; zinc also is used in various die castings, such as brackets, cone bases, etc.

Electrodeposition of Iron

A Paper Describing Methods of Depositing Iron and the Uses of Such a Deposit Read at a Meeting of the Electroplaters and Depositors' Technical Society, Clerkenwell, England

By T. JOHNSTON

Any interest which is presented by electrolytic iron arises from its application to industrial processes which are based on its purity and physical properties. Such applications at the present include:

1. The "steel-facing" of printing blocks.
2. The repair or "building-up" of worn and undersized parts for engineering purposes.
3. The production of finely-divided magnetic material.
4. The refining of pig-iron, scrap iron, and iron ores for:
 - (a) The preparation of "pure" iron for research and testing.
 - (b) The direct manufacture of tubes, sheets, and strip.
 - (c) The manufacture of high-grade steels and alloys.

In considering the deposition of iron from the theoretical standpoint, it is evident that some difficulty will be encountered by reason of the pronounced tendency for hydrogen ion discharge to occur. Thus:

1. Iron has a high solution pressure, and a correspondingly base equilibrium potential.
2. Its hydrogen over-voltage is low.
3. Its equilibrium potential is baser than that of hydrogen. (In N. FeSO_4 . $\text{Fe} = -0.46\text{v}$. $\text{H} = -0.41\text{v}$.)
4. For metal deposition, iron requires a considerable polarisation, which increases rapidly with current density, and with continued deposition.

For satisfactory and efficient deposition, the ratio of metal ions to hydrogen must obviously be as high as possible, and the maximum use of compensating factors (such as high temperature, high conductivity, and concentrated solutions) must be made.

DEPOSITING SOLUTIONS

A large number of different electrolytes have been suggested and used, but they are almost invariably modifications of the simple ferrous sulphate or ferrous chloride solutions, or mixtures of the two salts. Various other substances have been added with more or less success, to improve the quality of, and to impart definite characteristics to, the deposit. They include, among others, the chlorides and sulphates of magnesium, sodium and ammonium, chromous chloride, and various organic substances, such as ammonium oxalate and acetate, hydroquinone, etc. Solutions representing these three types are as follows:

1. The "Fischer-Langbein" (Chloride) Solution.

Ferrous chloride	450 grams.
Calcium chloride	500 "
Water	750 c.c.

This solution gives good results over a fairly wide range of working conditions, but not at the ordinary room temperature. For current densities up to 120 amps. per sq. ft. the temperature should be $60\text{-}70^\circ \text{C}$, and at $110\text{-}110^\circ \text{C}$ as much as 240 amps. per sq. ft. can be satisfactorily employed. This electrolyte forms the subject matter of the Langbein-Pfanhauser patents, and is probably the best to use for general purposes.

2. The Burgess Hambuechen (Sulphate) Solution.

Ferrous ammonium sulphate	275 grams.
Water	1,000 c.c.

This electrolyte was used by Burgess in America for the production of pure iron for scientific testing purposes. He employed a C.D. of 6-10 amps. per sq. ft. at 30°C , but the Westinghouse Co. use the same solution at 60°C . and a C.D. of 50-60 amps. per sq. ft. for the salvage of worn machine parts by "building up."

3. Watts and Li's (Sulphate Chloride) Solution.

Ferrous sulphate	150 grams.
Ferrous chloride	75 "
Ammonium sulphate	120 "
Water	1,000 c.c.

This solution was employed in connection with the production of smoother, and more uniform deposits by the use of addition agents. It was operated at the ordinary temperature, and a low current density of 10 amps. per sq. ft. This can be considerably increased by raising the working temperature. An electrolyte of somewhat similar composition has been employed at the plant of the Western Electric Co. for producing finely-divided iron or specified electrical characteristics, for conversion into magnet cores.

CONDITIONS OF DEPOSITION

Electrolytic iron exhibits an unusual range of characteristics for it is peculiarly responsive to even slight changes in the relation between metal concentration, temperature, movement (of electrodes or electrolyte), anode corrosion, current density, cathode potential, composition, conductivity, and volume of electrolyte. All these factors modify the properties of the deposit. They probably do so through their influence on metal ion concentration and current density at the cathode surface, which are of fundamental importance in determining the extent of crystal growth and crystal formation. Where the ratio of C.D. to metal ion concentration is relatively high, mechanical modification of the deposit, apart from its internal structure, is likely to occur. Generally, where dense, ductile homogeneous deposits are required to be produced rapidly and efficiently, the essential conditions are:

1. Maximum circulation of electrolyte and/or movement of electrodes.
2. As high a C.D. as possible consistent with the maintenance of a correspondingly high metal ion concentration at the cathode.
3. High metal (ferrous) concentration in the electrolyte.
4. High temperature.
5. Electrolyte of high pH value (*i.e.*, low acidity) preferably containing chlorides, and free from impurities and organic salts.

Where the conditions are suited to the production of a fine-grained deposit, the material is likely to exhibit greater uniformity in properties and structure, and therefore greater freedom from mechanical defects. The influence of these conditions on the cathode material is of much greater magnitude, however, when they are resulting in rapid deposition and fine structure.

The defects to which electrolytic iron is subject are those common to other deposits, but they are, perhaps, more accentuated. They include pin-holes, cracks, inclusions, internal strain, brittleness, splitting, peeling, and poor adhesion.

These can be very largely avoided, however, and the properties of the metal controlled by careful adjustment of the deposition conditions.

ACIDITY, HYDROGEN ION DISCHARGE, AND FERRIC SALTS

In iron plating solutions, the hydrogen ion concentration is of great importance, and its accurate control is difficult. Free acid has a remarkable and immediate influence on the structure of the deposit changing it from the so-called "normal" to the "fibrous" type, and modifying considerably such properties as hardness, ductility, magnetic permeability, resistance to corrosion, and its behaviour on subsequent annealing. In the electrolytic process, increased acidity results in rapidly lowering energy efficiency, cathode "resolution," and alteration in the composition of the solution. A very small quantity of free acid, however, acts beneficially by restricting the growth of excrescences, and the precipitation, and inclusion of basic iron compounds in the cathode iron. The most suitable pH value for iron deposition in the sulphate-chloride solution is probably about 5 if the solution is agitated. At this value the ferric salts are precipitated, and become available for depolarizing purposes while ferrous salts will remain in solution. In at least one refining plant, ferric hydroxide is actually added to the cathode compartments of the electrolysis cell for this purpose. Ferric salts in solution have a definitely harmful effect on the deposit, causing it to become loosely adherent, broken, and very liable to split and peel as soon as any appreciable thickness is attained.

These effects are accomplished by others already associated with free acid which always increases with the content of ferric iron.

ADDITION AGENTS

The value of many organic addition agents is a matter of some diversity of opinion, and further precise work as to their use in iron deposition is needed. Of all the materials which Watts and Li used in their investigation of this subject, only two were found to exercise any beneficial influence. But the conditions under which the deposits were formed were somewhat restricted and confined to the sulphate-chloride solution. More recent workers do not advocate the use of organic materials. Powdered charcoal appears to minimise some of the troubles associated with hydrogen discharge if kept in suspension, and is employed

in "building-up" processes. A small quantity of glue certainly retards the development of surface irregularities, and ferrous carbonate is of value in maintaining a pH value of about 5.5 if freshly precipitated and kept in suspension. Deposits from solutions containing oxalates are liable to contamination with carbon.

PROPERTIES OF ELECTROLYTIC IRON

Electrolytic iron is commonly believed to be very pure.

Under the most favourable deposition conditions, and after thorough annealing it may be so, but it may also contain appreciable amounts of "impurities" derived from the raw materials used. Before annealing, the metal may contain comparatively large volumes of occluded gases which are partially evolved at 100° C. and lower, and are only completely removed at 1,500° C. According to published analyses the purity may reach 99.96—99.99 per cent. Suitably deposited and heat-treated, the metal is highly ductile, and somewhat resembles copper in its working qualities, and is, therefore, particularly suited to cold work, stamping, and swaging. It is claimed that it can be quenched without appreciable hardening. Iron tubes made electrolytically can, after annealing, be crushed flat without fracture. They are extremely ductile, and free from corrosion, and being light and uniform, they have been advantageously used for boiler and radiator tubes.

Consideration of refining processes is beyond the scope of the present paper. Plants are in operation on a large scale in France, Germany, America, and England. The material is usually produced by the electrolysis of concentrated ferrous chloride solution, the liquor being regenerated by circulation over fresh quantities of raw material. The most recent development described by T. S. Hutchins in English patent 197,066, 1922.

CONCLUSION

The requirements of electrolytic materials are largely determined by the somewhat exacting limits imposed by engineering and metallurgical considerations, and since iron is influenced to a far greater extent than most other metals by its electro-deposition conditions, the necessity for close control of the process is correspondingly important.

While it must be admitted that large scale deposition should be preceded by adequate scientific investigation, laboratory results should be applied with considerable caution and foresight, for in extensive operations, small scale conditions can seldom be reproduced and considerable modification may be necessary to effect the economic production of electrolytic iron.

Brown, Blue or Black on Steel

Written for The Metal Industry by CHARLES H. PROCTOR, Plating-Chemical Editor

There is a method patented for coloring iron and steel brown, blue, red-green and black. The following solution is used: water, 1 gallon; caustic soda, 14 oz.; sodium nitrate, 6 oz. Temperature 200°F. Reversed current must be used to produce desired results; voltage 5 to 6.

The articles become anodes for 5 minutes; sheets of carbon as the cathode. Then reverse the articles to cathode; carbon becomes the anode. Then reverse again to anode; carbon becoming the cathode.

A double throw switch will be required. Possibly a reversal of two minutes or a total of six minutes will

be ample. Finally lacquer the surface or oil with a light China wood oil.

If it is necessary to use an iron surface upon the nickel silver to obtain the colors specified then an iron solution can be prepared as follows: water, 1 gallon; ammonium chloride, 6 oz.; ferrous chloride, 2 oz.

Operate the solution cold at 4 to 5 volts; anodes sheet steel. Be sure to obtain the ferrous chloride—not the ferric.

The latter cannot be used. The patent number of the process outlined is 1,342,910, June 8th, 1920.

Racking Automobile Parts

How to Hang a Wide Variety of Work

Written for The Metal Industry by WILLIAM E. BELKE, President, Belke Manufacturing Company

Having discussed the principles of racking in the last article,* by explaining the benefits of scientific rack design, this article will illustrate the proper way to rack automobile parts.

The illustrations shown include practically every important automobile part now manufactured. The purpose of showing why different racks should be used for different parts is not to encourage the creation of a huge rack file in the plater's plant, but merely to illustrate that proper plating can take place only when the product is racked in a manner to receive an even coat of metal. In theory, racks may be considered only as a means to an end. For the proper plating of any article, it is only necessary to have the surface to be plated in the most advantageous position in its relation to the anode. This advantageous position is possible only with a rack properly constructed.

BUMPERS

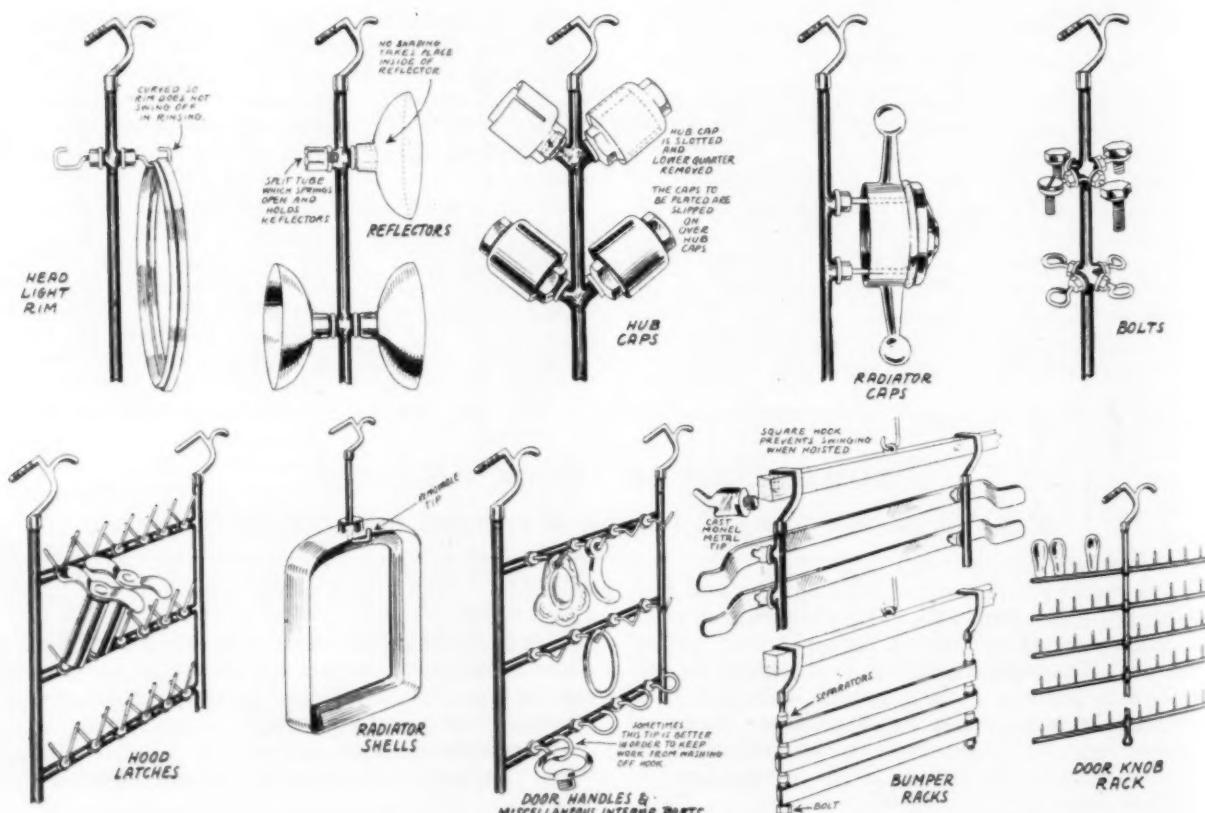
Probably the most difficult and interesting problem will be found in racking bumpers. To be sure, a bumper may be suspended from the cathode by means of a wire, and it will receive plating of a kind. But to suspend the bumper on a wire means to limit the capacity of the tank, and cause waste in time and metal. Also, there is the danger of bumpers swinging, and touching each other.

*See our May issue, pages 196-7.

The illustration shows how the maximum number of bumpers may be racked, thus allowing greater use of the tank than otherwise possible. A rack is constructed with a square hook, which will fit over a metal bar. This metal bar is then given electrical connection to the cathode bar. Two racks are used, one for each end of the bumper, and a separator is placed between each pair of bumpers. In the case of the bumper with curved end, where it is desired to give a plate to the top and bottom of the bumper as well as the side, a separator with beveled ends should be used, which will only serve to separate the bumpers, and not touch in any place where it is desired to give a plate. The other type of bumper, with the straight end, is best racked by means of a curved hook of cast monel metal. This fits into the hole at the end of the bumper, and, while holding it securely, does not cover any part which should receive metal.

HEADLIGHT RIMS

The headlight rim is graphically explained. As there is very little place on the headlight rim which does not receive plate, it is necessary to arrange a hook which merely supports it, but does not touch it further than to allow good electrical contact. Because of this fairly loose method, it is wise to use a curved hook, upon which it can be suspended, but which will prevent it from swinging off in rinsing. Swing in the tank should be possible also, although not necessary, as a slight motion will always enhance plating.



METHODS OF RACKING DIFFERENT TYPES OF AUTOMOBILE HARDWARE.

HEADLIGHT REFLECTORS

A peculiar problem is met in plating headlight reflectors. When the first reflector came to our plant to be racked, some years ago, I called in the superintendent of the rack department, our research head, and plating expert for a conference, for here was a problem. Headlight reflectors had always caused considerable trouble to the plater. Some had wound a wire around the outside, where it does not receive plate, but this was unsatisfactory. Others tried to hold it by the neck, and suspend it downwards, but this necessitated complete re-arrangement of the anode bars. A hook was impossible, for it would extend in and touch the inside of the reflector, and leave a mark. We finally devolved a split tube, which springs open and holds the reflector by the inside of the neck. Simple as this was, it required special machinery, and special tubing, for quantity production, for it was difficult to make the spring slight enough to enable quick racking, and strong enough to hold the production.

DOOR KNOBS

The illustration of door knob racks, shows to what extent the imagination may be exercised to provide a proper method of racking this simple part. One manufacturer said: "Why make any kind of a special rack? Any rack with an ordinary hook will hold a door knob." True, it will, but he did not say how long. A horizontal or angular tip will hold a knob only until it shakes off. To put vertical hooks on the spine meant to limit one rack to only about a half dozen knobs, and consequently waste space. By means of arms extending from the spine, and straight tips extending upward, it was found possible to plate one hundred knobs at one time.

DOOR HANDLES

When we come to door handles of different types, and miscellaneous interior parts, if a different rack is to be made for each and every different minor part, the average plating plant will be spending thousands of dollars on storage space to keep all the racks. In this case it is necessary to utilize a universal hook. On the average, a tip bent at an angle will hold almost every part that

has a screw hole in it. If the part is not held well, it is wise to use a circular hook to prevent it from washing off. It is not a bad idea to have a rack with several forms of tips, so that, when a miscellaneous lot of articles are to be racked, it will be found that there are several hooks of each type to hold them.

MISCELLANEOUS PARTS

Hood latches illustrate the elemental principle emphasized throughout this series of articles, e. g. good contact, but absolute exposure of every part to be plated.

The illustration of radiator shells, requires some explanation. It will be observed that a plain rack, with merely conventional hook, is used to uphold the radiator shell. However, it is imperative that this tip be removable, as it takes a plate very quickly. Care should be taken to prevent swinging in the plating tank, for the unstable support of a hook is not sufficient to prevent it from banging into another radiator shell. However, a well constructed rack will hold the shell quite securely.

A problem which confronts the plater when preparing radiator caps and hub caps has been solved. It is evident where a product so constructed as the radiator cap which is die cast, that the problem of racking would be great. Handling these products is like hanging a delicate piece of white silk on the clothes line. You don't want any part of it to touch the line, but you must hang it. The only way is to get at the inside in some way, and this is accomplished by means of two bent tips which afford spring contact. A rod agitator is always used when plating, and the contact must be perfect. No more than three caps should ever be suspended from one rack.

In seeking for something to hold the smooth inside of the hub cap, many days were spent in our plant looking for tubing which would be of similar shape. Finally it was decided, quite logically, that nothing looks like a hub cap so much as another hub cap. So another hub cap was taken, the sides were slotted to permit spring expansion, and the bottom piece was taken out, and it was found that the hub cap fitted perfectly. Thousands of this type of rack are used, particularly for companies plating Ford hub caps.

White Jewelry Metal

By JEWELRY METALLURGIST

Q.—We are anxious to secure a white metal that would be soft to work and at the same time can be hard soldered.

A.—The problem of finding a white jewelry metal that will be soft to work and at the same time capable of taking hard solder, is not easy to solve unless you are willing to spend money.

The obvious answer is: use platinum. Platinum can be made as hard or as soft as desired (by using more or less iridium, for instance) and it certainly can be hard soldered.

As to white gold: the palladium-gold alloys answer this description too. They are sold by various dealers, in various hardnesses. The best palladium-gold is about 80% gold and 20% palladium. This is rather soft, and sometimes a little nickel or rhodium is added as a hardener. A very little copper may be used as a cheapener, also. But the best alloy is the simplest—the 80%-20% gold-palladium.

Most of the white gold on the market is whitened with nickel. Other metals are added to make the combination softer to work, etc., but the whitener is nickel.

The nickel-gold alloys will take hard solder, but are generally hard on tools; and if badly annealed, or if improperly handled in the original melting, even the best formula will yield hard and brittle metal.

The "Discovery" of Aluminum*

By MARTIN TOSTERUD and JUNIUS D. EDWARDS

Oersted's classic experiments (1825) are briefly described. Two years later Wöhler modified Oersted's experiment, using potassium metal in place of potassium amalgam to reduce the AlCl_3 . Recently Fogh verified Oersted's results; a dilute potassium amalgam works best. Tosterud and Edwards again repeated the experiments of Oersted and found no difficulty in obtaining aluminum metal analyzing 99 per cent Al. It was found that if only 0.05 per cent Hg was present in the aluminum metal produced, that such metal would react with water to form hydrogen.

*Abstract of a paper read at the Philadelphia meeting of the American Electrochemical Society, April 28-30, 1927.

Greaseless Metal Finishing Compositions

A Description of the Dry Method of Producing Brush Brass and Satin Finishes

Written for The Metal Industry by R. S. LEATHER, Lea Manufacturing Company, Waterbury, Conn.

Experience in the metal finishing trades shows that a greaseless composition for producing brush brass or satin finishes is the most practical and economical, if a greaseless composition can be obtained that will stand up under all temperature conditions. This dry method, using a greaseless composition, is by no means new. In fact, the metal trades used this method twenty years ago, but until recently the great trouble with greaseless compounds was in the binder. They were made of a mixture of glue and water, with the addition of acetic acid or similar chemicals to prevent too rapid a deterioration of the glue. This mixture was not commercially practical on account of the low melting point of the glue and water mixture and its rapid deterioration, especially during the hot summer months. The glue compound would air harden very rapidly and within a day or two become as hard as a rock. If kept in a moist place to prevent drying out, it would generally take up too much moisture and become a soggy mass. It was necessary to make up a fresh supply every few days, keeping it on ice. The operators received only small pieces for immediate use. Consumers were compelled to make this composition in their own plants, as it was not practical to ship it any distance.

The objectionable features of greaseless compositions have been overcome during the last few years. There are compositions now on the market that stand up under all conditions, practically no deterioration taking place. These compositions are usually put up in metal foil containers. The abrasives used are aluminum oxide or some similar abrasive having quick cutting qualities. The binder has a very high melting point; in fact, much higher than the ordinary tripoli compositions. It is a rubbery substance with adequate sticking qualities and containing a small amount of moisture. The metal foil containers prevent evaporation of the moisture. This moisture will evaporate or dry out to some extent if the metal container is removed and the compound is allowed to stand unprotected over a period of time. Usually the metal foil is torn away as the bar is used and the exposed end of the bar covered or immersed in water when not in use. One of the peculiarities of the new greaseless compositions is the fact that, although they lose moisture on exposure to the air after the metal container has been removed, they will take up their original amount of moisture and no more when placed in water or a damp place.

When the compound is applied to the wheel it functions somewhat differently from the regular grease compositions. The binder, having certain adhesive qualities, sticks the abrasive on the surface of the wheel, where it dries rapidly, due to the revolving wheel. This produces a quick-cutting, dry, abrasive-coated wheel with a flexible surface. When starting a new wheel it is best to give it an extra heavy coat by holding the bar of greaseless compound against the wheel until one or two inches have been used up. The wheel then has an excessive amount of composition which must be allowed to dry for a minute or two, or a piece of lump pumice can be run across the face of the wheel, which causes it to dry more rapidly. If an excessive amount of compound is put on the wheel and the work applied before it has a chance to dry, the work will pick up some of the compound. Some concerns have found it practical to use two wheels on the same spindle, applying the compound to one wheel and working on the other.

The compound on the wheel not in use has an opportunity to dry thoroughly and stick firmly while the other wheel is being used. This accomplishes a substantial saving in the consumption of composition. Naturally there is a slight amount of dust when using a dry wheel, so that a good blower system should be used.

In using greaseless compositions, several different types of wheels are employed, according to the class and nature of the work to be finished. The speed and diameter of the wheel also varies. The most commonly used is an eight or ten-inch loose muslin buff packed one to one (one large and one small disc) at a speed of from 1,000 r.p.m. to 1,500 r.p.m. This seems to be the most practical for the ordinary run of work. A wheel over twelve inches in diameter at a speed exceeding 2,000 r.p.m. is not practical, as the composition will not stick to the wheel properly. A slow lathe with a fairly small buff produces a good dull finish. With high speeds or large buffs the work has a tendency to be too bright for ordinary purposes. Sewed buffs are used where considerable cutting down is required. Loose muslin buffs, either packed or unpacked to meet the users' requirements, have excellent cutting qualities and a more flexible face than sewed buffs. Felt wheels are used for relieving or hitting the high points on ornamental articles.

Very soft felt wheels are also used on some classes of work. They give an excellent dull finish. Walrus hide wheels are used on steel where a high polish is required. Small dies are polished with a small walrus hide wheel on a flexible shaft, using a greaseless composition with a quick-cutting abrasive. Tampico wheels give a duller finish than the cloth wheels. Horse hair brushes are used where a very dull effect is required. Tampico and horse hair wheels have very poor cutting qualities. When they are used the work is usually cut down with either a greaseless composition on cloth buffs or a tripoli composition.

If a tripoli composition is used the work has to be thoroughly cleaned before finishing with a greaseless composition. When the cutting down and finishing are both done with a greaseless composition, it is necessary to clean the work before operations. Canton flannel loose buffs with a coarse weave are also used. When this type of wheel is used the diameter should be about twelve inches at a speed of 2,000 r.p.m. The wheel is thoroughly raked out, leaving long threads which become coated with the greaseless composition. The work is put against the wheel with considerable pressure and the long abrasive coated threads perform a sort of whipping operation, giving an excellent dull finish. This method is used on canopy shells for electrical fixtures, but can be applied to almost any class of work.

The work to be finished by the dry method should be clean and free from all oil or grease. Any oil or grease on the work will naturally be picked up on the greaseless wheel. A greasy or oily wheel will not hold the greaseless composition properly and is likely to cause trouble in lacquering.

Greaseless compositions are used to produce a scratched or satin finish on plated articles. The articles are washed free from grease or oil, cut down on a twelve-inch sewed buff at 1,000 r.p.m. with a greaseless composition containing a quick-cutting abrasive. The objects come from the wheel very clean, but should be given a quick wash to eliminate any finger marks the workmen are likely to

leave on the work, plated and brushed on an eight or ten-inch loose buff packed one to one, at 1,000 r.p.m., using a greaseless composition containing a mild abrasive. The work comes from the wheel absolutely clean and ready for packing, assembling, or any further operation.

Stamped articles are cut down and brushed with greaseless compositions in either one or two operations, depending upon the class of work and the finish required. Small articles are dipped, ball rolled, finished and lacquered.

In eliminating the final washing and drying operations on castings sweating out is prevented. For relieving oxides

dized finishes a mild composition is usually used on an eight or ten-inch buff at 1,500 r.p.m.

Greaseless compositions are used only for producing brushed or satin finishes except on very hard metals, such as hardened steel, where a high polish can be obtained. The dry method is apparently not adaptable for producing high finishes on brass and similar soft metals. In the production of a high finish, lubrication of some kind is necessary, although considerable experimental work is being done to produce a greaseless composition that is suitable for polishing and coloring.

Barrel Japanning

Production Methods of Applying Japan to Metal

Written for The Metal Industry by HAROLD C. BOOTH, Sales Engineer, The Henderson Brothers Company, Waterbury, Conn.

The barrel japanning process is widely misunderstood, in spite of the fact that it has been in more or less general use for many years. It is the purpose of this article to outline the process and briefly describe some of the whys and wherefores.

While the basic procedure is given in terms of specific work and materials, these terms are intended in a general rather than a specific way. For example the term japan includes practically all the similar coloring agents as enamels, paint, lacquers and the like.

First it should always be remembered that in any kind of finishing, the parts to be finished should be clean before application of color, plate or whatever is to be the finish. You would not think of painting your automobile or house right over an accumulation of dirt, dust and grease. Neither should you attempt to finish metal or wood parts without cleaning off the dust or oil picked up by the manufacturing processes.

When the work is clean, a measured quantity is put into the tumbling barrel and color is added as the barrel begins to rotate. After tumbling until the work is properly coated, the work is dumped on screens, shaken out, and baked.

For succeeding coats the same process is followed, with the exception that these coats use less japan than the first or body coat.

If buttons are the product, here is about what should be done. Put about one peck of buttons into an open end tumbling barrel adding part of a cup of japan (fairly thin) while the work is in motion. Tumble for twenty minutes, (determine exactly on your own job by experiment), after which the work should be dumped onto several shallow screens, shaken out so as not to bunch, and placed on racks in the oven for baking.

The first coat probably will not completely cover the work giving a good body color. After this a second coat should be applied which will smooth and cover the first, and the two coats combined would make the finish.

As a general rule, there is a surplus of japan used on the first and sometimes on all coats. In the writer's opinion this is an error. By using a graduated glass beaker to pour the enamel and by adding a little at a time until the proper amount is used, you will soon be able to get equivalent results with no surplus.

This will benefit you in several ways;—by cutting the waste; by less tendency of the coated parts to stick together; and also by a smoother and better wearing coat of color. The last is due to the fact that the coat is rubbed on by a tumbling action and thus will not bead and lump up in spots.

On the other hand, on some cheap work where the purpose of japanning is as much for rust proofing as for finish, the excess quantity is probably just as good a method as the other.

Invariably more than one coat is required by this process. The succeeding coats in this case are not so much to cover the work as to build up the finish in the same manner as succeeding coats of varnish are used on fine furniture finishes. Some very high grade barrel work takes as many as eight coats but the usual job is either two or three.

Up to this point, fillers and similar materials have not been mentioned but these must be used on rough or porous work. You should take up this matter with the firm from whom you expect to buy your color. Where the products of two or three firms are all used on the same job sometimes there is difficulty due to one not being suitable to use with another.

Fillers are usually applied by the same process, though sometimes a paste filler is necessary which necessitates handling each piece. You can apply a liquid filler more easily and it should be used if possible.

There is quite a range of possible barrels to use although the regular japanning barrel is a tilting or as it is sometimes called an "open end barrel" with an outward flare. The shape of this barrel is such as to allow air to circulate around the work while being japanned. Incidentally it also allows easy inspection of work without shadows in the barrel.

It would not be good policy to conclude this article without mentioning various applications of the tumbling barrel method of japanning. This process can be used on all materials, shapes, and even on all sizes up to a certain limit.

When the work is of such a nature as to tumble successfully but not rub over itself the japanning is accomplished by the addition of a dummy load of small parts. These get into the corners that work rubbing over itself cannot.

There are also variations of dipping and tumbling. One of these is the case of dyed wooden parts, which are dipped in dye, dried and waxed in a tumbling barrel. There is another variation of this same nature where the work is colored, then smoothed by tumbling with strips of sand paper and then a final coat added. This last process gives a rubbed finish.

There is also the combination process of using the barrel to turn over the work and spraying the color on. This is in somewhat general use where the work is irregularly shaped.

Methods of Handling Gold and Platinum Wastes

How to Recover Values in the Jewelry Factory. Part I.

Written for The Metal Industry

By C. M. HOKE

Consulting Chemist, the Jewelers Technical Advice Company, New York

All jewelry shops, large and small, concern themselves with the recovery of the precious metals in their wastes. This is a matter of shop routine that is now recognized as necessary and commonplace.

There are many different kinds of wastes, and many different kinds of shops. We have high-grade wastes, such as old jewelry and clean clippings of metal, and low-grade wastes such as floor sweeps. Also, we have large factories and small ones, as well as those which handle gold but no platinum, those that handle platinum but no gold, those that handle both; and so on.

This article will attempt to describe fully the more important cases, and at least mention all the others.

SHALL THE JEWELRY SHOP REFINES ITS OWN WASTES?

In general it pays a jewelry shop—even a small one—to refine its own high-grade wastes. In general it does not pay a jewelry shop—even a large one—to refine its own low-grade wastes. This sentence is the whole Law and Gospel of shop refining. The problem now is to draw the line between high-grade and low-grade, and also to note the exceptions to this law.

The well-informed jeweler is the man who knows exactly what to refine himself, and what to sell to the professional refiner.

The first exception to the law is the case of the jeweler who handles only gold and silver—no platinum or platinum group metals. In most cases he does well to melt his wastes up into buttons and sell them to the U. S. Assay Office, which can generally refine them more cheaply than he can do it himself. (Large factories handling much material, however, frequently refine this material themselves, recovering the fine gold and making up new alloys in their own shops.)

The Assay Office, however, gives no credit at all for platinum or the platinum group metals. If you send in buttons that contain platinum, it will pay you for the gold and silver content, but not a cent for the platinum. This fact must always be borne in mind.

DIFFERENT KINDS OF WASTES

The most valuable kind of waste metal is old jewelry and clean scrap and trimmings. These may be gold, or platinum, or the material so popular now—platinum top soldered to a white gold base. Or any other combination; often palladium is a factor. Next in value come filings and turnings, which contain more or less assorted dirt, such as binding wire, bristles, shellac, bits of paper, tobacco, emery rouge, steel from the files, and what not.

Next in grade comes polishing dust, and finally floor sweeps, wash-barrel settling, and old crucibles. The floors of jewelry factories, when old and worn, are taken up and burned, and the ashes are often surprisingly rich.

All these materials require different treatment. The principles, however, are easy to understand, and any modern jeweler should be ashamed of not knowing about them.

MISINFORMATION

While it is true that there is no mystery about the principles of refining, there is a lot of misinformation. The reason is this: When platinum was first used in jewelry, it was cheaper than gold, and it did not pay

to work very hard to recover it. Thus, if a pennyweight cost \$2, and was so intermixed with dirt and trash that it would cost \$2.50 in chemicals and labor to recover it, we simply threw it away. Later, when platinum got up to \$4 and \$5 a pennyweight, the wise jeweler was willing to make this recovery.

This meant different methods. And unfortunately some jewelers learned about the new methods through a sort of underground route—a sub-rosa exchange of "secrets," etc. All this knowledge is scientific knowledge easily obtained through legitimate means, and it is unfortunate that when going through this underground route it often became badly confused.

ADVANTAGES AND DISADVANTAGES OF DOING YOUR OWN REFINING

The advantages are obvious in the case of high-grade waste. Suppose you have \$1,000 worth of old jewelry, clean clippings, etc. If you send it to the professional refiner, you must pay several charges: (1) The interest on the value of the metal while it is tied up and not working; if that is two months, at 6% per annum the sum is \$10. (2) An assay should be made, and it will cost from \$10 at the least, up to \$35 or more, depending upon the number of precious metals present. (3) Cost of packing, shipping, and insurance during transit. (4) The refiner's legitimate fee and profit. The total may run up to \$40, or considerably more, sometimes as much as \$150 if the refining is complicated.

Now, if you can refine that metal in your own shop, you can reduce the time during which the metal is idle; you will cut out the assay entirely, and the shipping expense. And your expense for chemicals and labor is generally less than the refiner's fee plus his profit; it should not be any more. In a well managed shop, this total may be quite small; with fairly clean metal to start with, it might well be as little as \$5 for the \$1,000 worth, and even with a complicated piece of refining, the total is reasonable.

The space and equipment needed for refining high-grade waste is well within the possibilities of most jewelers, even the crowded New York City shop whose rent is high. These points will be discussed later in detail.

Handling low-grade waste is a very different matter. Only a few of the very largest plants are equipped to handle it.

Let us make this difference clear: Suppose you have a lot of floor sweeps, in which say \$1,000 worth of metal is scattered in fine particles. The lot may easily weigh as much as 500 or 1,000 pounds, while the \$1,000 worth of old jewelry and clean scrap can be held in your hand. To refine this huge bulk of floor sweeps, a large quantity of flux is needed; the mass must be heated in a big furnace for a long time, probably the precious metals will be collected in lead, which in turn must be gotten rid of, and the button must finally be dissolved in acids and the precious metals recovered. This work must be carried on in large lots or it does not pay at all.*

* For a description of this process, see THE METAL INDUSTRY, for May, 1927, pages 183-7. "Irvington Smelting and Refining Works," by Adolph Bregman.

Naturally you cannot expect to receive \$1,000 in cash in exchange for this material, nor should you attempt to make the recovery yourself unless you have exceptional equipment.

As to the disadvantages of doing your own refining: These will differ in different shops; one man will be quite unable to get rid of the fumes that always arise in the work; another will have a fan that disposes of the fumes, but he will be unwilling to learn the proper methods of refining, and so will lose enough metal to make his refining too costly. A third is unwilling to entrust the job to anyone except himself, and he is too busy to do it.

The beginner always fears that his refining will be unsuccessful in the sense that his metals might be impure at the end. This is an important consideration. The professional refiner's reputation depends upon his turning out pure metals, and he generally does it. The shop refiner can do quite well enough if he uses proper care, good methods, and intelligence. This is in his own

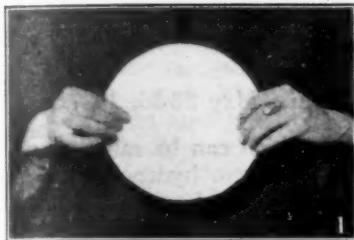
They are operated from a lamp socket, and are handy and economical in every way.

(2) Space for the work. The small shop will probably run down a batch of metal once a month, and will clear away a space of about 3x4 feet on a table near a fan or window. The job generally extends over parts of three days—the work will be started, left to stand or to dissolve, etc., and will require only occasional attention, off and on. At the end of three days the dishes, funnels, etc., can all be put away. Once or twice a year the odds and ends, "tailings," old filter papers, and so on, will be cleaned up, this meaning another three-day spell, usually coming during the slack summer months.

The big shop will have a room set aside for refining. A space 8 x 10 feet is big enough to handle an immense amount of precious metal. Good light, either natural or artificial, is required, good ventilation by means of an exhaust fan or a flue is essential, and running water is a convenience.

(3) A person to do the work. He (or she) should

How to Use a Funnel and Filter Paper



1—Use a paper of the right size to fit your funnel.



2—Fold it in half.



3—Fold again at right angles; this gives you a triangular piece of four thicknesses.



4—Open it up, with three thicknesses on one side and one on the other side.



5—Fit it into the DRY funnel, and then wet it with water. (This shows one way of using the wash-bottle. Hold your thumb against the stopper.)



6—Press the paper in with your two hands, pressing it down smoothly so that the liquid will run through rapidly.

hands; if he is lazy his metal will probably be of poor quality; if he is careful and patient, it will be of as high quality as he desires and ready to be used again.

REQUIREMENTS FOR SUCCESSFUL REFINING

Successful and economical refining within the jewelry shop does depend upon certain things. Here are the most important ones:

(1) Disposal of fumes. The best method—cheapest to install and most convenient in operation—is a fan placed in a wall or window, and facing outward. The old flue, fume chamber, and hood, are all expensive to install, take up a lot of room, etc., but are very convenient if already available. The main trouble is with the lining; if metal, it keeps scaling off and dropping into the solution. Therefore the hood should properly be made of glass, supported in wood frames, and well lighted. Now that electrical equipment is so cheap, a fan is within the reach of all, and there are models that can easily be fitted into any window frame, and moved around readily from window to window if necessary.

have enough interest in the work to read and follow the directions. Sometimes the proprietor himself does the refining, but in most cases he is too busy with other duties. Some of the best refiners we know are girls—girls who keep the metal accounts, and do the refining from time to time. They enjoy the work and turn out clean metal.

Some shops make the mistake of entrusting the refining to a porter or janitor. Generally such men are uncomfortable if they have to do much reading, and so they stick to antiquated methods, with loss of metal, rather than read up on the new methods. In general, clerks and bookkeepers make pretty good refiners; they are not afraid of the printed word, and are used to doing things neatly.

REFINING AT HOME

Now and then we find a jeweler doing his refining at home, in the evenings and on a Saturday afternoon. This

is not a bad plan. Sometimes this is done because there are regulations in the office building that forbid the use of stoves or acids; sometimes because the jeweler likes to do the work himself—and has no other time for doing it.

If he has the space he can sometimes rig up a "refinery" that is almost ideal. We have in mind the basement laundry of a house in a New Jersey suburb. There is running water, a stove with two burners, a table and shelves, and a fan set in a window. A big electric light furnishes illumination. When he has occasion to leave a solution standing for some time, he uses the following method of controlling fumes: The dishes are set in large flat pans, like bread pans, in which stands about an inch of water. Over each dish is inverted another broader vessel of glass or any other impervious material, its edges resting in the shallow pan of water. The fumes are caught in this water trap and do not escape at all. By the simple plan of keeping his work on shelves when not in use, and by staying out of the way on wash-day, he has no conflict with the household authorities.

In another basement there is an unused flue; in front

of this has been placed a little chamber about four feet square, made of window glass, shaped about like a dog house and lit with electric light. Here the jeweler does all his refining work, and very good work it is, too.

There are several advantages to home refining; the danger of theft is reduced, and since the work can be taken up or put down at any time, the jeweler is not apt to work too rapidly and sacrifice the quality of his recovered metals.

Right here, we might add that this refining is extremely interesting work to many people; they enjoy doing it, and in some cases we find men refining material of such low grade that the labor does not pay for itself in money—but does in interest.

In subsequent chapters the following will be discussed in detail:

(1) Refining precious metal wastes that contain gold and silver but not platinum; (2) that contain platinum but no gold; (3) that contain both.

In addition the question of assaying, and the problem of disposing of material that the jeweler should not refine himself, will be discussed.

Electrochemical Society Meeting

Abstracts of Papers Read at the Fifty-First General Meeting in Philadelphia, May 28-30, 1927

The Protective Value of Nickel Plating—Supplemental Observations

By C. T. THOMAS AND W. BLUM

About a year ago a paper was published by the authors on this subject. Further observations upon the nickel plated samples exposed to the atmosphere are reported in this paper. Duplicate plates were exposed to the atmosphere of Washington for 15 months. All deposits had a total thickness of 0.025 mm. (0.001 in.).

The results of accelerated corrosion tests on nickel plated steel, when expressed in terms of the periods required to produce initial corrosion, furnish no accurate criterion of the behavior of such materials on protracted atmospheric exposure. Porosity measurements, such as the ferricyanide test, expressed in terms of the reciprocal of the number of perforations in a given area, usually give an approximate indication of the behavior on atmospheric exposure. Nickel deposits with a high iron content turn yellow and permit excessive corrosion of the underlying steel. Deposits containing a substantial copper layer, either prior to the nickel coating, or between two layers of nickel, furnish far better protection in the atmosphere than deposits of pure nickel of equal thickness.

High Speed-High Frequency Inductive Heating

By E. F. NORTHRUP

High frequency inductive heating permits of almost unlimited speed of heating of a continuous conducting mass. The new 300 lb. (136 kg.) commercial alloy melting furnace is described. It is especially designed for melting ferrous alloys. Power is supplied by a 150 k. v. a. generator at 1,920 cycles and 900 volts. The very rapid heating gives a very high melting efficiency. Various examples are cited and efficiency calculations appended. Nichrome required 462 kw.-hr. per metric ton.

On the Potential of Aluminum in Aqueous Solutions

By LOUIS KAHLENBERG AND SIDNEY J. FRENCH

The potentials of pure aluminum and commercial aluminum have been measured in aqueous solutions of KCl. Pure aluminum develops a slightly higher voltage. Oxy-

gen depresses the voltage, which can be raised again by displacing the oxygen by nitrogen, hydrogen, illuminating gas or carbon dioxide. The voltage can thus alternately be raised or lowered at will, showing that an oxide film is not the cause of the low voltage in oxygen, but that the low values are caused by oxygen adsorbed by the surface of the metal. Amalgamating the surface raises the voltage materially and also greatly increases the corrosion.

Twenty-Five Years' Progress in the Electrolytic Refining of Copper

By S. SKOWRONSKI

The annual production of electrolytic copper in the United States has increased to five times that of 1902. The capacity of the United States copper refineries today is about one and one half million tons. The multiple system of refining is used more generally than the series system, as it permits of higher silver values in the anodes. The current density in the Atlantic seaboard refineries is about 13 to 15 amp./sq. ft. (1.43 to 1.65 amp./sq. dm.) The adoption of the Wohlwill process for the refining of gold has increased the percentage recovery of Pt and Pd. Cottrell precipitators are universally used for the recovery of precious metals from the refinery plant fumes. The casting furnaces today have a capacity up to 400 tons, as compared with 100 tons in 1902. Oil and powdered coal have superseded soft coal as fuel. Green poles continue to be the cheapest and most efficient means for reducing the oxygen content in the molten copper, before casting, to the prescribed 0.05 per cent. The direct leaching of copper ores with subsequent electrodeposition has become a very important factor; the copper produced is equal in quality to the electrolytically refined.

Practical Uses of Pure Nickel

By R. J. MCKAY

Chemically pure nickel does not show any marked differences in properties from the present grades of high purity. The application of very pure commercial nickel are discussed. Sulfur-free nickel is now a commercial product. New and possible applications of the metal are pointed out.

*Other abstracts were published in our issue of May, 1927. See also page 237 of this issue.

Metals in Trans-Atlantic Airplane Flights

The interest of the whole world has been aroused by the successful trans-Atlantic airplane flights.

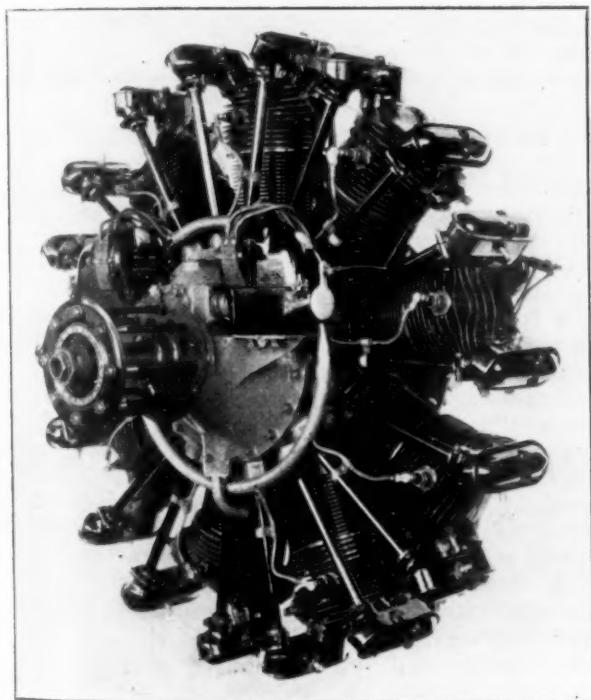
Captain Charles A. Lindbergh drove a Ryan monoplane from New York to Paris, France, in one hop. He left New York at 7:52 A.M., May 20, and reached Paris at 3:25 P.M. (New York time), May 21, covering 3,600 in 33 hours.

Clarence D. Chamberlin, pilot, accompanied by Charles A. Levine, owner of the plane, drove a Bellanca monoplane from New York to Eisleben, Germany, in one hop. They left New York at 6:05 A.M., June 4th and landed on June 5th at 12 Midnight (New York time), covering about 3,800 miles in 42 hours.

The Ryan plane is built largely of tubular steel, almost the only metal part being the propeller which is made of duralumin.

ALUMINUM ALLOYS IN ENGINE

Non-ferrous alloys are used extensively in the construction of the Wright "Whirlwind" aviation engine which was used in both planes. The cylinder heads, the pistons, the crankcases, and hundreds of smaller parts are made of cast aluminum alloys, each alloy selected for characteristics suiting it particularly to the type of service



WRIGHT "WHIRLWIND" AIRPLANE ENGINE

it will do. The cam consists of an aluminum alloy hub riveted to a machined alloy steel ring on which the internal driving gear and the cam itself are machined. Most of the parts of the oil pump, the fuel pump, the intake manifold, the carburetor, the rocker supports, and the accessories, are made of aluminum alloys.

COPPER IN ENGINE

Copper is used only in the numerous copper and copper asbestos gaskets, and in the high tension ignition wire. Copper is also used for the oil drain pipe, the oil suction pipe, and the carburetor feed pipe.

BRASS IN ENGINE

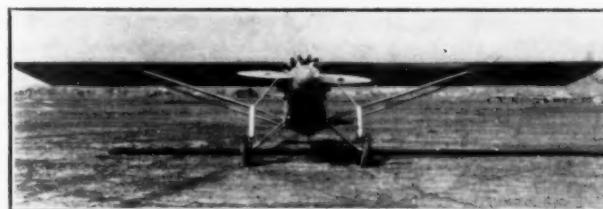
Brass is used in the Lunkenheimer priming pump, the priming fittings, the $\frac{1}{8}$ inch primer tubing, some of the carburetor fittings, the fine and coarse screens of the oil strainer, other parts of the oil strainer, ignition wire terminals, spark plugs, magnetos, and many small parts of the carburetor.

ALUMINUM BRONZE

Special hard aluminum bronze is used in the valve seats, the rings which support the main roller bearings in the aluminum crankcase, the spark plug bushings, the exhaust flange studs and a number of other locations.

BRONZE

Various bronze alloys are used here and there. The counterweights are made partly of steel and partly of an extra heavy bronze containing about 25 per cent lead. The valve rocker bushings are also made of this high-lead bronze. Bronze bushings are used for the gear train driving the magnetos and the cam. A bronze bushing is



RYAN MONOPLANE "SPIRIT OF ST. LOUIS."

used in the fuel pump, and a babbitted bronze bearing is used at the tail end of the crankshaft for oil feed from the oil pump. The master connecting rod bearing, however, is babbitt on steel.

EUROPEAN AVIATION

The striking advance of aviation in the past few years is shown perhaps more clearly abroad than in the United States. Aside from the spectacular flights such as Lindbergh's, there is steady progress in long distance flying. Germany has concentrated upon this problem as a commercial venture and, is said to be actually building a plane capable of carrying 130 passengers, a large crew and all the equipment necessary to cross the Atlantic. Commercial flying in Germany has achieved unusual results in reliability. It is stated that last year only one serious accident occurred. In that accident 4 passengers were killed; over 56,000 passengers were carried during that year and 4,000,000 miles flown.

All over Europe passenger lines are being operated in increasing numbers, a development far in advance of that in the United States, in which the only regular flying comparable to that abroad is the Air Mail Service.

Like the airplane he bravely attempted to fly from Paris to New York, Captain Nungesser is part metal, says The Associated Press. The feat of bringing down forty-seven enemy planes during the World War, that brought him every decoration within the power of the French government to bestow, was not accomplished without injury, and at the close of the conflict Nungesser virtually was patched together with platinum. Surgeons replaced shattered bone in his skull, elbows, thigh, knee and foot with metal.

Foundrymen's Meeting in Chicago

Information About the Meeting at the Edgewater Beach Hotel, June 6-10

The meeting of the American Foundrymen's Association is being held in Chicago, Ill., just as this issue of THE METAL INDUSTRY goes to press. For that reason, we can give only a preliminary statement, but a full report of the proceedings will appear in our July issue.

BREAKFAST MEETINGS

Among the features of this convention are the specially arranged breakfast meetings held by all divisions to promote acquaintanceship. At this convention for the first time the practice of meeting and discussing problems at breakfast will be recognized officially by the Association. As practically all the members will be staying at one hotel, provision is being made to get together those of each branch at these informal gatherings.

FOUNDRY COSTS

A considerable part of the time will be devoted to the question of costs. The Cost Committee will show how uniform cost accounting methods are being instituted by the organizing of local groups of foundries which have their members follow a uniform cost system.

APPRENTICE TRAINING

The Committee on Apprentice Training will discuss the local group or co-operative training methods which are meeting with considerable success. Apprentices of the right type can and are being secured; in fact, it is stated that several foundries have waiting lists.

SAND TEST METHODS

The Joint Committee on Foundry Sand Research will have a demonstration of equipment in common use to test and control foundry sands. An attendant will be present, who will explain methods of testing for various qualities and also the grading classifications.

FOUNDRY INSTRUCTION

A special meeting will be devoted to the problem of foundry instruction in technical schools. They will make inspection trips to foundries and manual training schools among other activities.

NEW DIRECTOR

As reported in a previous issue of THE METAL INDUSTRY, W. D. Goldsmith, Treasurer of C. A. Goldsmith Company, Newark, N. J., was nominated for the office of director of the American Foundrymen's Association to serve for three years. As no other nominations were made, Mr. Goldsmith, along with the other nominees, has been regularly elected. On page 263 of this issue will be found a short sketch of his business career.

Jesse L. Jones, metallurgist of the Westinghouse Electric and Manufacturing Company of East Pittsburgh and metallurgical editor of THE METAL INDUSTRY, is the author of a paper to be presented before the Association Technique de Fonderie de France. This meeting will be



EDgewater BEACH HOTEL, A. F. A. HEADQUARTERS

held in Paris, France, the second week in September, 1927. Mr. Jones' paper will be on the Effect on the Quality of Pig Iron of the Addition of Iron and Steel Scrap to the Blast Furnace.

PROGRAM OF THE CONVENTION

The complete program of the convention, with a list of the papers devoted to metals, was published in our May issue, and for that reason will not be given here. Special reports, however, will be presented by the Sub-Committees of the Molding Sand Committee. These reports will cover the testing of sands for refractoriness and the testing

of molds for permeability.

LADIES' ENTERTAINMENT

There will be no lack of entertainment for the ladies during the whole week. There will be drives, golf, a dinner party, theatre party, luncheons, boat rides and shopping tours.

For the men, the fact that there is no exhibit this year provides an opportunity for other activities, which include entertainment features and visits to plants. As Chicago is such a large manufacturing center, the list of plants open to visitors is larger than ever before.

GOLD MEDAL AWARD

The Joseph S. Seaman gold medal of the American Foundrymen's Association has been awarded this year to Major R. A. Bull. Major Bull is Research Director of the Electric Steel Foundries Research Group.

ABSTRACTS OF PAPERS ON METALS

THE IMPROVEMENT OF ALUMINUM BRONZE AS AN ENGINEERING MATERIAL

By DR. R. C. READER, BIRMINGHAM, ENGLAND

It is now known that the useful properties of the plain 10 per cent aluminum bronze can be further improved and troubles avoided by the following methods:

1. The addition of one or more extra elements.
2. The use of chill castings instead of sand castings.
3. Correct casting temperature, and in the case of die casting, a correct mold temperature.
4. Correct mold design and correct position of the casting in the mold.
5. Correct position of the feeder head, and
6. The employment of heat treatment.

A NEW TYPE OF MOLD DRYING OVEN

By G. H. WRIGHT AND J. M. SAMPSON

Nearly four years ago it became necessary to build an additional large car type mold drying oven in the steel foundry of the General Electric Company at Schenectady. Plans of the usual type of oil-fired oven were submitted for approval, but before acceptance could be obtained, the

question arose as to whether or not the principles used in drying porcelain and other materials could be incorporated.

This involved drying in a more or less humid atmosphere, and keeping up a fairly brisk circulation of the atmosphere within the oven, at least during the major portion of the drying time.

Preliminary tests in a small oven seven feet square by eight feet high were made and showed promise. Later tests were made on a larger oven, and after two years of experimental tests they proceeded with the design of the present large oven, which is described and illustrated in this paper.

BUREAU OF STANDARDS SOIL CORROSION INVESTIGATION

Second Progress Report on Unprotected Pipe

By K. H. LOGAN

The type of corrosion is in some way associated with the locality in which they are buried. It has been assumed that this is due to some characteristics of the soil of the locality. Serious corrosion has been found in several localities and, on account of this, an attempt to associate corrosion with soil characteristics seems desirable.

The investigation of bituminous coating materials indicated that the thin dip coating under test furnished inadequate protection against severely corrosive soil conditions. A further study of protective coatings is needed.

While the corrosiveness of several soils must be recognized, attention should also be called to the fact that in

the majority of soils the rate of corrosion is low and in some it is practically negligible. There seems to be a tendency for the rate of corrosion to decrease with time in most soils and the rate of penetration of the pipe wall apparently decreases more rapidly.

On account of the possibility of the entrance of new influences as the specimens grow older, because of the apparently decreasing rate of corrosion indicated by the 1926 specimens and because of the large differences in corrosion of the different specimens of the same material under nominally similar conditions and the few specimens of each material so far examined, it is unwise at present to draw conclusions as to the relative merits of the materials under test or the probable life of any of them.

THE EFFECTS OF MOISTURE ABSORPTION ON THE PROPERTIES OF DRY-SAND CORES

By H. L. CAMPBELL

This paper deals with an investigation made to determine the changes in strength and permeability of dry-sand cores when placed in green-sand molds for different periods of time. Nine core-sand mixtures were used, the binders being linseed oil, rosin, pitch, cereal flours, sulphite liquor, molasses and dextrin. Conclusions reached were that the deterioration in strength is dependent on the type of binders used and length of time left in moist mold. The permeability is not changed on exposure to moist air for periods of time up to twenty-four hours and the amount of moisture absorbed by dry-sand cores from closed green-sand molds is relatively small.

Silver and Cadmium Alloy

Written for The Metal Industry by E. D. GLEASON, Foundryman

An alloy composed of 60 parts of silver and 40 parts cadmium has some wonderful characteristics. When rolled to sheet, which it will readily, being very ductile and when polished, it is highly resistant to atmospheric conditions. When a rubber band is tightly placed around it the rubber will become rancid, hard and brittle in time, but the silver-cadmium alloy will not be affected or discolored. The same procedure applied to sterling silver will turn it black in a few hours due to the sulphur in the rubber. It can be left in the albumen of an egg until the albumen becomes hard and it will not be affected. To a certain extent the alloy can be said to be "untarnishable," but the fracture discloses a faint pinkish white color which would hardly be detected except by one skilled in the manipulation of silver.

I have made large quantities of this material and it requires some practice to produce it, due to the fact that cadmium is very volatile, giving off a light brownish oxide. It must be handled in such a way as to have a small melting loss both in the making and in the remelting. My practice was first to melt the fine silver under a heavy cover of boracic acid and glass, fusing it at the lowest possible temperature. I would then add the cadmium in round bars which I would bend and hammer down into small compact pieces. I would add this to the silver, rapidly stirring at the same time, then allow the heat to fuse it so the metal will be just sufficiently fluid to pour into ingot molds for rolling. If you attempt to add the cadmium as you would zinc in small pieces you would not succeed in getting any cadmium into the melt as it would fume off as fast as you

could add it. Also, cadmium is a dangerous element to handle, especially on a production basis, due to the fact that when inhaled or taken into the system it makes one deathly sick, causing vomiting and purging. The melting department should be well ventilated and a respirator should be worn.

The idea prevails among quite a few concerns making sterling silver that a fraction of an ounce of cadmium added to 1,000 ounces of silver makes it whiter and otherwise improves the quality. It is generally thrown on top of the molten metal, quickly stirred and preparations are then made to lift the pot. In my opinion, this is no more than a faith cure for subsequent analysis will not disclose a trace. The cadmium volatizes off the instant it comes in contact with the molten silver.

Some years ago I was connected with a concern that was making a large line of toilet novelties such as hair brushes, combs, jewelry boxes and the like, in which Britannia metal was the base. This concern was using anodes composed of cadmium and silver in the proportion of 60 silver and 40 cadmium. The method of procedure was to prepare a silver solution using any good formula and as many anodes as necessary. Before the regular work was put in they would plate on a special cathode for a few hours so as to get the cadmium in the bath and diffused. After a few weeks or a month they would add more silver solution but not before a brownish appearance would come on the work. This work, plated with silver and cadmium was never lacquered and neither would it tarnish due to atmospheric conditions.

The Reduction of Molding Losses

How a Large Brass Company Improved Its Foundry Performance. A Paper Read at the Chicago Meeting of the American Foundrymen's Association, June 6-10, 1927

By R. A. GREENE

Assistant Manufacturing Superintendent, Ohio Brass Company, Mansfield, Ohio

High foundry losses and especially molding losses are not always prevented by chemists, metallurgists, or engineers. Many of you know of foundries maintaining excellent laboratories and technical organizations whose loss and quality of product is entirely out of proportion to the technical effort that they are expending. However, the tendency of modern thinking is more and more toward the combining of theory and practice.

The real problem that we have now to consider is—what can be done to get closer union or co-operation between the molders, the instructors, the foremen, the chemists, the metallurgists, the engineers, or any other groups in any way connected with this line of activity, with the idea of producing quality castings with a low loss.

It is not our intention to attempt a complete answer to this all-important problem, but we have developed certain plans or schemes which in practice do materially contribute to its solution. While some of the ideas are not necessarily new, the manner in which we are applying them may be of interest to you.

One of the difficulties and perhaps the greatest difficulty in connection with this program was the problem of arousing the interest of the foundry workers in the theory of their problem that is available through the technical department. Molders, as a rule, are not noted as great seekers after scientific truth. It was hoped, therefore, to develop in them a bit of the engineer's spirit, inciting them to study the why and wherefore of their losses more carefully.

In seeking a solution to this problem, the baseball plan of organization was continually coming to mind. If the earnestness, the "head work," and the team work that prevails in a baseball team could be duplicated in a foundry, real results would be possible.

How are these things promoted in a ball team? We decided that they were the result of **accurate records, publicity, and friendly rivalry**. Upon these we decided to build our system.

ACCURATE RECORDS—NUCLEUS OF A SYSTEM ALREADY IN OPERATION

For some time the molders at The Ohio Brass Company have been paid for the number of molds they make, less the castings that are dirty or shifted; hence, it is necessary to keep each molder's casting separate from the time they are made until they are passed by the inspector. To get an accurate record of all the bad castings, it only remained to elaborate this system somewhat and provide forms on which the inspector's findings could be recorded for display.

An accurate count of our production is obtained as follows: In the brass foundry each molder's floor is poured off about eight times a day. The castings, however, are not gathered as soon as they are shaken out, but are piled at the side of the molder's floor where they remain until the end of the day. At the end of the day's run, the castings are carefully counted by the instructor. The molder's count, which he keeps to check his pay, must agree with the instructor's count before the castings are moved. In the beginning, we had some difficulty in getting these to check, but after a few week's operation, the discrepancies practically disappeared.

In the brass casting department, which is the first stopping point, the cores and sprues are removed, the castings are sand blasted, rough ground, and sorted; castings from each pattern being put into suitable containers. Attached to each container is the original record showing the molder's clock number, the pattern number, and the number of castings as filled out in the beginning by the foundry production department and checked by the instructor.

The containers are now delivered to the inspector who divides the castings into good and bad, and the bad he further divides into dirt, shift, mis-run, core trouble, spoiled and short. Short shows that the good and bad together do not equal the total called for on the instructor's ticket.

It has been my experience that as soon as a worker discovers that his efforts are not accurately recorded, and he is quick to sense this, he relaxes his efforts, takes less and less pains, until finally the quality of his production is below what is desired. He tries to use good judgment, but, as a rule, unless he is a mechanic with an intelligence above his present position, his judgment as to just what to slight and what not to slight is often erroneous.

PUBLICITY—CREATING INTEREST—ATTRACTING ATTENTION

The inspector now turns in to the inspection department's clerk his findings, which the clerk posts on the sheets. There is one of these sheets for each instructor's group for each day. It not only shows each molder's record, but also the group's or the instructor's record for the day. Care is taken to keep the same rotation of the molder's numbers, so that by putting the sheets together a molder's record can be easily seen over any period.

The sheets are so arranged on the bulletin board that each molder's total loss, molding loss, and foundry loss is shown for each day of the week. That is, first Monday's sheet is displayed; when Tuesday's sheet is displayed it is put on top and covers Monday's, with the exception of the last three columns.

When these sheets are displayed, the daily total loss and daily molding loss of each group is plotted on the quarterly graphic record. At the end of the week, or at the time that Monday's sheet of the next week is ready, the record of the combined loss of all the groups as well as the loss of each group is blocked in, either with blue or red. At this time, the finished week's daily sheets are removed and the new week started.

The records, the forms, and the charts were arranged with the idea of attracting attention. Blue and red figures were used, blue for loss less than 5 per cent, and red for a loss above 5 per cent. The bulletin board was a rather elaborate affair—made so purposely. Heads and men of other departments were asked to give the posted records at least a cursory glance as often as possible. We tried to imitate the baseball score—the more spectators the greater the enthusiasm—the greater the enthusiasm the keener the competition.

The supervisor's opportunity at this time to hear about the instructor's troubles is obvious. Many statements and criticisms are made and arguments are started that can readily be used to advantage by a supervisor, who is trying to reduce the loss.

For instance, the supervisor will make some remark to the instructor about one of his molders who has been running a certain pattern with what looks like an excessive loss. The instructor will admit that the loss is excessive, that he has tried several things without success, that the foreman has made some suggestions that have been tried but were not successful, and the loss still continues. The supervisor looks at the job, thinks about it, talks about it, brings it to the attention of the foundry superintendent, to the metallurgists, to the chemists, and in many cases to the manufacturing superintendent—the main idea being to get as much attention as possible focused on any job running with a loss higher than the average.

A molder is running with an excessive loss, the cause of which, upon investigation, is found to be defective cores. When the instructor's attention is called to this, his excuse is that the cores are supposed to be inspected by the core department and come to him perfect. He is told that while his remarks may be so, nevertheless, that does not entirely relieve him of the responsibility. A mere glance at the box should tell a man of his experience whether they looked good or bad, and if they looked bad he should further investigate. He is also told that he should teach his molder something about good and bad cores. Now some one of the instructors will think about remarks such as this and will make a reduction in his loss. This reduction is pointed out to him and commented upon. It will also be noted by the other instructors who, through the exhibit, are eagerly seeking just such things as this. They study the exhibits to see how and where another instructor reduces his loss.

Another good illustration is the spoiled casting loss. This loss is made in removing the sprues, either by the sprue cutter or by the grinder, and formerly was not shown on the instructor's sheet. This loss, however, helped to increase the scrap, and it was thought that if the help of the instructor could be enlisted another source to attract attention would be brought to bear on the men who were responsible for this loss. It also made another division in the record over which, with proper handling, competition could be aroused between the instructors. Another chart was designed for the sprue cutters. On this chart was recorded daily the castings spoiled in removing the sprues. This procedure reduced the spoiled casting loss from about 1,300 castings to less than 100 a week.

Shortage was another division of the loss to which very little attention had been paid. Shortage was caused by carelessness in counting. In weight counting it was caused

by not having the scales checked occasionally. The castings spoiled by the sprue cutter would be thrown in the scrap, either, as mentioned before, because he thought that it was not necessary to put them in with good castings, or else to hide his carelessness.

To enlist the interest of the instructor in all this work not only was his sportsmanship aroused by the display of his records, but he was put on a bonus. This bonus was so arranged that it did not function unless the weekly group loss was below ten per cent. It was thought that this plan would be an incentive, although it has not come up to expectations. Some of the instructors have asked to have the bonus taken off, preferring to be on a salary.

FRIENDLY RIVALRY—COMPETITION

The third idea, that of inciting rivalry or competition, was perhaps the major idea in mind in the design or arrangement of the whole system. It was thought that if competition in reducing loss could be aroused between the molders and between the instructors, and also if a molder or an instructor or the foundry as a whole could be incited to strive to excel previous records, commendable results could be accomplished.

If an instructor has a molder who is having trouble with dirty or misrun castings, he, of course, consults his foreman, but he is encouraged to seek information from the technical department, too. We feel that the more theory that we can get mixed up with practice the better results we eventually achieve.

In order to encourage this close relation with the technical department, we have taken groups of instructors and molders into our laboratory and have discussed with them the methods used in controlling the metal, the cores, and the sand. The pyrometers were explained to them. They were shown how to measure the bond, the permeability, and the moisture content of molding sand. The relation of these properties to casting losses was discussed. This has helped the instructors and molders to understand their problems better and has also resulted in better co-operation.

Now, the results of this arrangement are very commendable. We started this scheme in the latter part of 1923. The loss for this and previous years was around 8½ per cent, which represented approximately 400,000 pounds of bad castings. For the years of 1924, 1925 and 1926 the loss has averaged between 4 and 4½ per cent, making a saving of approximately 200,000 pounds of castings a year for the last three years.

Cleaning Wire

Written for The Metal Industry by W. J. PETTIS, Rolling Mill Editor

Q.—I am interested in the best methods of drawing, annealing and cleaning phosphor bronze and low brass wire. At present I am cleaning with cold solution of dilute sulphuric acid, but I cannot get the wires all one color.

A.—Your trouble seems to centre around one thing, that is the color of the metal. There are many things that could cause this trouble, apart from the drawing or annealing operations, except where annealing conditions are such as to affect the relative hardness or softness in different parts of the coil. This would also cause trouble in weaving the wire into cloth as well as a slight variation in color.

Another cause is tarnishing after the washing process and exposure to the atmosphere. These alloys you mention will tarnish quickly if there is moisture left on the coil for any length of time.

This could be determined by a careful examination

of the metal immediately after leaving the bath, and note if any discoloration appears. If the metal is clean and discoloration takes place later, there is some fault in the drying method.

In wire as small as .003, this could hardly be observed before spooling or bunching the metal up. Handling with the bare hands is another cause of staining.

Your method of cleaning the wire is the general practice; a 6% solution of sulphuric acid, generally warmed by turning live steam in the tank. This gives quick action.

Bright annealing can be accomplished by packing the material in sealed containers. There are a number of industrial furnaces on the market that bright anneal. The manufacturers will give any information regarding their ability to handle certain lines of work. As the expense of installation is generally high a large production is necessary to justify the outlay.

The Microcharacter Measures Hardness

A Recently Developed Method of Testing for "Scratch" Hardness

Written for The Metal Industry by WALLACE W. BOONE and ZOLA G. DEUTSCH, American Radiator Company, Detroit, Mich.

Hardness is a term not yet precisely defined although all measurements involve several more or less fundamental concepts. Instruments employed to measure hardness utilize one or more of the following principles.

1. The resistance offered to scratching (scratch hardness).
2. The resistance offered to indentation (indentation hardness).
3. The resistance offered to elastic impact (rebound hardness).
4. The resistance offered to cutting (cutting hardness).

5. The resistance offered to permanent deformation (tensile hardness).

Unless a scratch produces cuts and chips there is actually no difference between a scratch and indentation. Cutting is a form of tensile rupture and plastic deformation. Hardness tests measure in different

point carefully down on the specimen, a drop of watch oil is placed in contact with the jewel and the specimen. The specimen, while tightly fastened to the microcharacter stage, is now moved slowly under the sapphire point by turning a small crank at about twenty R.P.M. The jewel is then lifted and the specimen carefully cleaned with pitch saturated in zylene. The watch oil must be thoroughly removed as it otherwise interferes with the refractive index of the immersion oil.

When the microscope is properly focused on the portion to be examined the cuts may be accurately measured and variations in constituents noted.

Figs. 2 and 3 show the width of cuts across FeAl_3 crystals in an alloy of aluminum, iron and silicon. The narrow portions of the scratches are on the very hard FeAl_3 constituent and the wider portions are over the softer solid solution matrix.

Fig. No. 4 shows a microcut as photographed through a millimicrometer ocular at 1,650 diameters magnification. FeAl_3 gives a microhardness of 1,200 while the

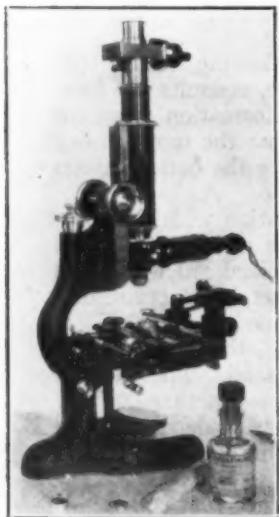


FIG. 1.
MICROSCOPE EQUIPPED
WITH MICROCHARACTER



FIG. 2.
CUT ACROSS FeAl_3 CRYSTAL
AND SOLID SOLUTION.



FIG. 3.
CUT ACROSS FeAl_3 CRYSTAL
AND X CONSTITUENT.

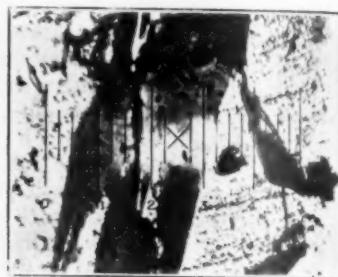


FIG. 4.
APPEARANCE OF MICRO CUT
THROUGH MICROMETER OCULAR

units the resistance offered to a combination of deformation and rupture. The reason no distinct correlation exists in the various scales of hardness is possibly because each measures varying proportions of the plasticity and rupture strength.

A "microcharacter" moves a sapphire point under a fixed pressure of three grams, over a highly polished surface of the material to be tested. The point is the corner of a cube, mounted in such a way that the diagonal of the cube will be perpendicular to the surface tested. The width of the cut, or scratch, or penetration, is a linear function of the depth, and a second power function of the cross sectional area. Therefore, measuring the width gives a means for assigning a numerical value to this characteristic, which is some combination of the several types of hardness.

Fig. 1 shows a compound microscope equipped with a microcharacter fitted with a jewel in position for cutting and a millimicrometer ocular, which has supported in its focal plane a fine scale on a transparent screen. This scale can be moved with a micrometer screw thus making it possible to measure accurately the width of a scratch or the metallic section. A polished section to be studied should be held level with plasticine and be securely clamped to the stage. After leveling the jewel and bringing the

script, probably FeSi in a web-like skeleton structure is about 260 and the solid solution averages 110. The scale load of microhardness is the same as the Brinell H —, the area values being multiplied by a large constant in order to keep them greater than one.

Similar to other such physical properties as electrical conductivity, heat, and light transmission which vary in different directions on the same crystal, the hardness also is found to vary in different directions on the same crystal. A polished surface contains a number of different crystalline orientations which necessitates the determination of average crystal hardness. Microhardness determinations on unworked and severely worked metal indicate an increase of hardness on the surface.

Note: The microcharacter was originally developed by the Special Committee on Bearing Metals of the American Society of Mechanical Engineers, with C. H. Bierbaum as chairman. He is vice-president of the Lumen Bearing Company in Buffalo, N. Y.

A short description of this testing device appeared in *The Metal Industry* for April, 1921, page 172.—Ed.

The Machining of Special Bronzes

Written for the Metal Industry by P. W. BLAIR, Mechanical Editor.

The demand that has been created for special alloys in the metal line with high copper and tin contents often presents difficulties in machining. The estimating department in particular has to be careful in figuring costs in the machining, that is, the turning and threading, where the material to be machined is out of the ordinary class and where previous experience is not a guide.

There are three qualities which produce the widest divergence of results in machining metals, namely, hardness, toughness and brittleness. Broadly speaking, the combinations of these three qualities usually met with may be said to be hard and tough, soft and tough, and hard and brittle. The degree of hardness of the material itself governs the speed at which it may be cut.

It is important that sufficient top rake be given to the cutting tool, particularly on materials where the resistance to bending and fracture is high and where heat is generated by the friction of the chip. With metals possessing these qualities tools of heavy section and efficient lubrication are necessary to carry away the heat and reduce friction and the greatest possible top rake is desirable consistent with cutting-edge strength and rigidity of support.

The machining of brittle metals can be done by tools possessing little or no top rake because of the low molecular resistance and absence of chip friction. For the same reason lubrication and cooling are not necessary and a large tool angle increases the strength of the cutting edge. Abrasion, however, increases and for this reason a higher degree of tool hardness is advisable. High speed steel therefore has not the advantage over carbon steel when machining brittle materials that it possesses when the material operated upon is tough.

Certain of the copper alloys now employed possess a comparatively low degree of hardness and toughness, and fracture or tearing occurs because the strength of the material is not sufficient to withstand the load imposed by cutting. This tearing is more apt to occur in operations such as threading and forming and in these cases paraffin is best to use. The use of lard oil gives better results but its employment is costly. With close attention to tool shape and hardness machining can be performed with soluble oil as a lubricant. The necessary conditions to be observed are the largest possible top rake, a large bottom rake and hardness sufficient for the tool to cut the comparatively soft material without undue wear.

Phosphor bronze is a hard and tough material to work on but when run at a rather slower speed than for mild steel and the cutting edge given a top rake of 10° to 15° good results should be obtained, provided the castings are uniform.

Gun metal, although not used as much as phosphor bronze, is a material with which the machine operator should be familiar. It can be turned successfully with the same speed as mild steel, with a tool having a top rake of 10° and threaded at a speed of 40 ft. per min.

Nickel silver can safely be treated like brass; also Benedict metal. They both take high polish and have good wearing qualities and tools do not require any rake. It is preferable to use open box tools. Nickel itself is a hard but consistent metal and properly alloyed it is not difficult to machine and thread.

Copper, which is a soft metal, is admittedly a difficult machining proposition, but it can be done on the turret lathe the tools must be of the best high speed steel and ground to give a cutting angle of 65° and run at a speed of 175 ft. per min. with a positive rake to the cutting edge of die. There should be a minimum amount of thread in the prongs of the die to reduce friction.

The hollow mill is a good tool for taking a roughing cut if not too heavy and for a low bearing surface the roll-steady finishing box tool should be employed; a vee steady box tool not being so efficient owing to the greater friction. The correct speed and low feed should be the practice when machining copper. The drill should have ample clearance and in some cases a flat drill of high-speed steel is to be preferred. Soluble oil is suitable as a lubricant and when tapping use a one-fluted tap with a sharp cutting edge and tap at a speed of 20 ft. per minute.

Aluminum or aluminum alloys containing 90 per cent aluminum are best turned at a speed of 175 ft. per minute similar to brass. Duraluminum is another alloy which has come to the front during the past ten years and is supplied in rods for turning into bolts, etc. The speed for turning and threading should be the same as brass. It does not drag when cutting and a mixture of one part of paraffin to four of lard is a good lubricant.

Monel metal, cast and rolled, one of the alloys that is becoming more popular each year owing to its high tensile strength and wearing qualities. It is a hard and tough metal. High-speed steel tools of the best should be used with correct cutting angles. Soluble oil can be used as a lubricant. The best speed to be employed varies in accordance with the hardness of the castings but an average speed of 60 to 80 ft. per min. with a depth of cut of $\frac{1}{8}$ in. will be found suitable. For tapping and threading use a speed of 20 ft. per min. with hook on flutes of taps and chasers.

Ever-dur is a new alloy with high wearing qualities now on the market. It has the same machining characteristics as the hard bronzes.

Match Plates

Written for The Metal Industry by W. J. REARDON, Foundry Editor.

Q.—Can you give us a method of making white metal match plates from sand molds?

A.—The method used in making white metal or aluminum match plates is to secure a first class mold and make up as many patterns as you desire to place in a mold. Use a flask $25^{\prime\prime} \times 32^{\prime\prime} \times 6^{\prime\prime}$, preferably a metal flask, with very perfect fitting pins. Make up the mold in the usual way. After the patterns are drawn from the mold place $5/16^{\prime\prime}$ strip inside the mold the size of the flask desired and fill in with sand outside the strip. This strip raises the flask up the thickness of the white metal plate, which is ap-

proximately $5/16^{\prime\prime}$. Care must be taken in getting the parting just right before the cope is rammed. The success of the plates depends on the way the parting and ramming is done. Be very careful not to ram down the patterns. Use Windsor Lock sand so as to get a smooth surface on your pattern.

If the mold is made properly very little work is required on the plate and perfect match castings are produced from such a plate. There is very little to making a match plate other than good workmanship, and raising up the plate the desired thickness.

Germanium

A Useful Metal in the Future?

Written for The Metal Industry by JAMES SILBERSTEIN, Metallurgical Engineer

Germanium is a rare element. It is found in small quantities associated with the ores of silver, lead, copper, tin and arsenic.

So far there has been no use for germanium in the industry and the price of this metal is very high. It may be, however, expected that increased consumption will result from development of new and cheaper methods for the production of germanium. It might be of interest to recall in this connection, that the price of aluminum was over \$500 per pound in the year of 1852. On account of the volatility of its compounds at high temperatures and its occurrence together with lead and copper ores, germanium is likely to be found in the flue dust of smelters reducing these ores.

PROPERTIES

Germanium resembles silicon both in its chemical and physical properties. Germanium is one of the elements which Mendelejeff predicted by means of his periodic law and which he called "ekasilicon" because he assumed its properties would be similar to those of silicon.

Germanium is a grayish white metal, brittle and lustrous. Its density at 20°C is 5.47 and it melts at 958°C. At elevated temperature germanium oxidizes to the dioxide GeO_2 . Germanium dissolves in aqua regia and sulfuric acid but not in hydrochloric acid. Nitric acid converts it to the dioxide.

Germanium metal can be obtained by reducing the dioxide with carbon. In order to purify the resulting metal, it should be washed with water and then fused with borax. The dioxide can also be reduced with hydrogen.

Germanium, like silicon, can be used as a detector* and may therefore find application in the wireless industry.

GERMANIUM-ALUMINUM ALLOYS

The alloys of germanium and aluminum are very inter-

*Metall und Erz, 1926, p. 682.

†Metall und Erz, 1926, p. 683.

esting. Germanium dissolves easily in molten aluminum* and forms a eutectic with this metal at 55% germanium. The eutectic composition melts at 423°C and may be useful as a solder for aluminum. Though aluminum can be soldered with alloys containing tin and zinc, the joints fail if exposed to corrosion of moist atmosphere after a time. At elevated temperature the rate of corrosion increases rapidly and the durability of the joints is therefore generally tested by exposing them to steam.

The eutectic alloy of aluminum and silicon would from a corrosion standpoint be desirable, but the melting point (577°C) is too high. Because germanium resembles silicon both in its physical and chemical properties it is to be expected that the eutectic alloy of germanium and aluminum will show similar corrosion resisting properties as the eutectic alloy of silicon and aluminum does. The eutectic alloy of germanium and aluminum will, on account of its much lower melting point, be considerably easier to use as a solder, and if it shows the expected corrosion resisting qualities, this alloy certainly will be more desirable than any other aluminum solder so far known.

The melting diagram of germanium and silicon has, so far as the writer knows, not yet been determined. If these two metals form a eutectic alloy, the ternary system of aluminum, germanium and silicon must form a ternary eutectic alloy with a lower melting point than 423°C. This ternary eutectic alloy should also have similar corrosion resisting properties as the binary eutectic alloys of aluminum and germanium and aluminum and silicon.

It has been found, that a small addition of germanium to duraluminum (with the following chemical composition: copper 4.5%, magnesium .5%, balance, aluminum and its usual impurities of iron and silicon) makes the rolling operation much easier.† This germanium-containing duraluminum develops its full hardness only after aging at elevated temperature, while common duraluminum does not need to be aged at higher temperature.

The influence of germanium on metals other than aluminum and silicon should also be worth study.

Angle on Threading Chasers

Written for The Metal Industry by P. W. BLAIR, Mechanical Editor.

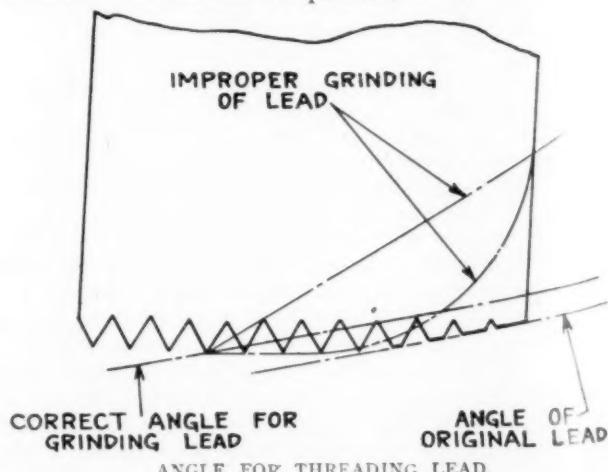
Q.—What is the correct angle to grind on the first three threads (more or less) as we do considerable threading on brass pipe and tubing; also brass castings in some cases where thread runs to a shoulder?

A.—Angle is the lead which is ground on the first three threads (more or less). As the heaviest cutting is done by the lead it should have a slightly greater clearance angle than the rest of the chasers on the die, but care should be used to see that this angle is not excessive. See illustration which shows the correct angle for regrinding the lead of a die which should be the same as the original set of dies. Improper methods commonly used are shown by dotted lines.

Too much clearance will cause the dies to lead too fast and the half threads cut by the lead are consequently damaged by the full teeth of the die.

It must also be remembered that the complete set of dies of any size should all be ground alike. A perfectly good set of dies can be ruined by improperly regrinding the lead. When threading to a shoulder lead should be

shortened to the desired length so that thread will run as close to the shoulder as possible.



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THE ELECTRO-PLATERS' REVIEW**

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EDITORIAL

ELECTRIC FURNACE PROGRESS

The electric furnace in the brass industry is no longer a novelty and a comprehensive review prepared by Dr. H. W. Gillett of the Bureau of Standards for the American Electrochemical Society lays vividly before us the fact that the brass industry, one of the oldest, most conservative and slowest to change its methods, has gone further with this revolutionary development than the steel industry in proportion to the tonnage output. In 1926 about 675,000 tons of metals were melted electrically. About 90 per cent of the output of rolling mills making brass, bronze and nickel alloys is melted electrically while foundries using these metals use electric furnaces for about 30 per cent of their output.

It is of interest to know what types of furnaces have been found after years of trial to be most useful. It seems that about 25 per cent of the electric melting in rolling mills has been made in rocking arc furnaces, the remainder, presumably, being made in induction furnaces. In addition, induction furnaces made about 12 per cent of the foundry metal electrically melted, this being almost exclusively yellow brass.

The future of the electric furnace in the rolling mills is stated to be rather small in the United States as this field is now largely saturated. Abroad, however, American furnaces are being sold in good numbers, also largely to rolling mills.

The future in the foundry is also difficult as such a large proportion of the foundries are very small. As a result it is harder to educate them to the electric furnace. It is also questionable whether, in most of these small foundries, the electric furnace, which is still an expensive installation with little flexibility compared to other types, would be a profitable investment. Depending as it does upon the regularity with which it can be used, the steadiness of the output of certain standard mixtures and a reasonable price for current, the electric furnace is extremely difficult to sell to a foundryman with only a few molders and a wide variety of work to handle.

The outstanding advantage of the electric over the open flame furnace is its lower metal loss. The advantage of electric over crucible furnaces is increased output and improved working conditions. The advantages of open flame and crucible furnaces over electric are low cost of installation and flexibility in operation.

Electric furnace manufacturers are aware of this situation, of course, and smaller sized furnaces are in existence. The rocking arc furnace is made to handle as little as 250 pounds. The high frequency induction furnace will handle very small quantities of metal.

It will be interesting to note whether the electric furnace will dig into the open flame and crucible furnace field from now on. Regardless of the future, however, industry owes a debt of gratitude to the finders and developers of electric furnaces, both scientists and industrialists. Dr. Gillett estimates that in 1926 alone, \$2,500,000 was saved in reduced metal losses and 40,000 tons in fuel.

METAL REEL STANDARDIZATION

The brass fabricating industry has taken what we believe to be its first step in the direction of standardization, in line with the work carried on by the Division of Simplified Practice of the Department of Commerce. At a recent meeting of the representatives of manufacturers, distributors and users of metal spools and reels, a recommendation was made to simplify the list of metal spools for annealing, handling and shipping wire. From now on, it is recommended that spools be built to carry only 2, 5, 10, 25, 50 and 100 pounds of wire.

In order to avoid the too sudden interference with existing equipment, this schedule is intended to affect only new production and gradually to replace the present spools as they are worn out.

Some of the members in attendance at this meeting represented the largest brass and copper manufacturing companies of this country.

One of those in attendance at the conference stated that his company had almost \$3,000,000 tied up in returnable spools and reels in circulation. Probably one-half of this frozen investment could be released if the numbers of sizes and varieties were cut down.

The brass industry is to be congratulated upon this step; not so much perhaps because it is such a long one in itself, but because it is an indicator of the right state of mind. In this age of alloys, it is only right that the largest manufacturers of alloys should not fall behind in the march of progress.

THE COPPER ALLOYS

The art or science of mixing and working nonferrous metals has undergone many changes in the last few years. In some ways the copper alloys, although the oldest known, have been through the most interesting changes. A talk by W. H. Bassett, Technical Supervisor of the American Brass Company, before the Chicago Section of the Institute of Mining and Metallurgical Engineers recounts the high spots in their progress.

The production of almost pure copper is an old art, as tough pitch copper was produced before metallurgy reached the copper refiners. For alloying, however, easy and rapid means are necessary to purify copper in smaller quantities. One of the earliest "addition agent" deoxidizers was zinc. Phosphorus was also used. Silicon, a later product, has proved extremely valuable. Manganese, magnesium, and in very recent years, boron and calcium, have been used to advantage.

The greatest efforts have been made in the direction of the elimination of impurities. Selenium, tellurium, lead, arsenic, antimony, nickel and iron are all trouble makers in one way or another. Silver, while of course, technically an "impurity" is beneficial.

The most generally useful of the copper-zinc alloys have been found to be the solid solutions. They are more resistant to corrosion than alloys in which more than one phase is present and also are less subject to cracking or splitting.

Silicon in addition to being a deoxidizer has been found

to be a good hardener. For example, silicon-manganese-copper alloys with silicon up to 3 per cent and small amounts of manganese, have a tensile strength of over 60,000 pounds per square inch and elongation of 48 per cent and in 2".

A very recent discovery has shown that nickel silicide dissolved in copper, forms a solid solution alloy at 750° to 800° C., which can be made considerably harder and stronger by quenching and re-heating to 500° C. For corrosion resistance, probably the best alloys are the copper-nickels. The nickel-silvers are best when the zinc contents are low.

An interesting group of copper alloys are those used for high strength conductors. In this field, it is necessary to make additions to copper to increase its strength without cutting down conductivity any more than necessary. Cadmium is the best commercial material with respect to retaining conductivity. Higher strength can be obtained with the addition of other metals such as tin, but conductivity is reduced.

BRASS MERGERS

There are two reasons for industries to merge. One is to facilitate expansion and take better advantage of a rising tide of business. The other is to effect economies in management and operation, and to protect themselves against elimination by over-severe competition brought about by the existence of too many companies in a field.

In this issue we publish reports of consolidations of an extraordinary number of metal manufacturing companies for so short a space of time. In Detroit, the General Brass Corporation is taking over three long-standing firms. In Montreal, Canada, the Canadian Bronze Company has acquired three large Canadian companies. In Philadelphia, the Hajoca Corporation has gathered up four plumbing supply manufacturers; in New York, the Safety Cable Company has purchased two large wire manufacturers to add to its existing list of three such organizations, and the National Bearing Metals Corporation has added three more companies to its string.

To say that this is only a flurry and a coincidence may be the truth, but it is impossible to keep from feeling that a number of straws blowing at one time (and these are large sized straws) indicate the existence of a strong wind. General business conditions throughout the year have not been buoyant. It is common conversation throughout the trade that prices are cut to the bone and that there seems to be no evidence of a reversal in this tendency, as the general price structure is falling. Consequently only the large and powerful organizations and the few specially favored small ones can operate profitably.

What is the answer? Obviously not liquidation, as there is no real depression. But companies cannot go on operating indefinitely without profits. Therefore they are recognizing the wisdom of hanging together rather than hanging separately.

It is our opinion that times such as these will induce consolidations for protection just as boom times will stimulate them for growth.

HANDLING LACQUER

The fire which occurred recently in the plant of a large automobile body building company in Detroit started in

the lacquer department. Information about the cause of the fire was not obtainable as the plant was completely destroyed. This brings forcibly to our attention the fact which is very well known but perhaps not so well remembered as it should be. Lacquer is an inflammable material and should be guarded with the utmost care. The spray booths, if they are used, or the tanks must be protected from electrical sparks, gas or flames of any kind. Ventilation and exhaust systems must be adequate to carry off fumes. Storage should be effected as far as possible outside of the main building.

We recommend for careful reading, to all those who use lacquer and other inflammable materials, the regulations of the National Board of Fire Underwriters of New York for paint spraying and spray booths, dip tanks and also the regulations for containers of hazardous liquids.

THE PLATERS' CONVENTION

When this issue has reached our readers, there will be little time to hesitate about attending the 15th annual convention of the American Electro-Platers' Society in Toledo. Even a glance at the program and the plans made, as shown in the leading article of this issue, will prove the value of this meeting. The exhibits will be of unusual interest, not only because they are of the best type but because labor saving equipment is becoming such an important factor in the plating field. It answers the question, "How can we reduce costs?"

We must repeat what we have said many times in these columns. Manufacturers can make no better investment than to send their plating foremen, chemists and superintendents to these conventions.

New Books

Endurance of Metals Under Repeated Stress. By H. F. Moore. Published by Engineering Foundation, 29 W. 39th Street, New York. Size 5 x 7½, 63 pages. Price \$1.00.

Among the large research enterprises in fatigue of metals has been the one at University of Illinois under the auspices of National Research Council and Engineering Foundation with the cooperation of important industries. Professor H. F. Moore has been in charge. To meet a demand for information in form usable by designing, inspecting, testing and operating engineers, Engineering Foundation asked Professor Moore to compile a small manual and invited other leading American investigators to cooperate. The product is the "Manual of Endurance of Metals Under Repeated Stress," presenting the condensed cream of the knowledge gotten by researches occupying several years of work by a score or more of investigators and many advisers, and costing in the aggregate a few hundred thousand dollars.

Metal Statistics for 1927. Published by the American Metal Market, New York. Size 4 x 6, 544 pages. Price \$2.00.

This is the annual edition of Metal Statistics containing business information concerning metals. New tables have been introduced and information on general economic conditions bearing on metal consumption.

GOVERNMENT PUBLICATIONS

Zinc in 1925. By Amy Stoll, Bureau of Mines, Washington, D. C.

Copper in 1925. By C. E. Julilin and Helena M. Meyer, Bureau of Mines, Washington, D. C.

Zinc in 1925. By Amy Stoll, Bureau of Mines, Washington, D. C.

CORRESPONDENCE and DISCUSSION

Although we cordially invite criticisms and expressions of opinion in these columns, THE METAL INDUSTRY assumes no responsibility for statements made therein

DISEASES OF PLATED DEPOSITS

To the Editor of THE METAL INDUSTRY:

I hope I am not intruding on your busy moments, but I have received so much instruction and help from Mr. Voss's series of articles "Diseases of Brass Deposits," which appeared in THE METAL INDUSTRY for June and July, 1926, that I felt I ought to write and thank you for them. There is no doubt that the articles referred to have helped many.

I worked for 10 years in a plating shop under a foreman who, when anything went wrong with any of the solutions, used to come back at night by himself to fix them up. I didn't think so much about it at that time, but, when he died (suddenly) I was asked to take his place. I did, and now at times I get absolutely up against it when the solutions go out of order, and since the articles by you have been such a help I have wondered if I may suggest that Mr. Voss write another series on "Diseases of Bronze and Copper Solutions" (cyanide). I hope you won't think me selfish. It is simply a desire to acquire a knowledge of my work.

May I name some of the problems I get up against. It may help you in your articles if you see your way clear to write them.

DISEASES OF BRONZE SOLUTIONS (CYANIDE)

Symptoms—Work plating yellow, patchy (red and yellow), red, streaky.

DISEASES OF CYANIDE COPPER SOLUTIONS

Work plating a dark color, streaky, uneven (muddy and clear). Anodes becoming dark, white coated.

Please accept my sincere thanks in anticipation of your help. I will be looking with interest in THE METAL INDUSTRY's future issues for your articles which I am confident you will write if you have the time to spare.

Montreal, Canada, May 16, 1927.

JOHN ROBB.

A WORD OF APPRECIATION

To the Editor of THE METAL INDUSTRY:

Your publication is of the greatest interest and value to one engaged in any way with foundry work and I found it most helpful while in charge of a brass foundry at the Coast Guard Depot, Curtis Bay, Md.

Your suggestions enabled us to make good composition castings which had proved impossible before receiving help from you.

R. E. WRIGHT.

Norfolk, Va., May 16, 1927.

HELP RECEIVED

To the Editor of the METAL INDUSTRY:

We want to thank you for referring us to Mr. A. Pfleomm of Baltimore, Md. Mr. Pfleomm was certainly a great help to us in standardizing all our plating solutions and we want to express our thanks to him through you.

E. & T. RADIATOR AND FENDER WORKS
Baltimore, Md., April 21, 1927.

TECHNICAL PAPERS

Glossary of Terms Relating to X-Ray Metallography. By L. W. McKeehan. Published by the Bell Telephone Laboratories, Inc., New York.

A list of all of the technical terms used in this new branch of metallography, and complete definitions.

Heat Treatment of Aluminum Alloys. By R. S. Archer.

This paper was presented at the meeting of the American Society for Steel Treating, held in Milwaukee, Wis., May 19-20, 1927. It will form the first of the data sheets on non-ferrous metals to be published in co-operation with the Institute of Metals Division and covers the heat treatment of Duralumin, 17S, 25S and 51S metals.

Industrial Cleaning: An Advancing Science. By D. J. Benoliel, International Chemical Company, Philadelphia, Pa.

An article published in "Factory" for May, 1927, which answers the following questions:

What makes a cleanser clean?

What factors determine the choice of a proper cleaning material?

What part does equipment play in effective cleaning?

Rapid Evaluation of Baked Japan Finishes. By E. M. Honan and R. E. Waterman. Published by Bell Telephone Laboratories, Inc., New York.

The service life of a japan film baked on metal can be evaluated by determining the rate of decomposition of the film when it is placed in an 8.5 per cent phenol-water solution. The effect of the time and temperature of baking the film and the cleanliness of the metal previous to applying the japan can also be evaluated. The 8.5 per cent phenol solution is a desirable testing solution because its composition is quite constant at ordinary room temperatures and is not changed by the evaporation of the water.

A Study of the Factors Affecting the Electrode Potentials in the Deposition of Nickel. By William Carleton Ellis, Ch.E.

The effect of current density, temperature, hydrogen ion concentration, addition agents, and superposed alternating current upon the electrode potentials in nickel deposition have been tabulated. Increase of current density increases the irreversible effect at the electrodes. Increase of temperature and

the superposition of alternating current lowers the dynamic electrode potentials. The change of hydrogen ion concentration within the narrow limits recommended for commercial practice causes no appreciable change in the electrode potentials.

Good deposits at high efficiency were obtained from nickel sulphate, sulphuric acid electrolytes when operated at high temperatures.

A discussion of the reactions occurring at the electrodes is included and evidence is presented to support the theory that gaseous deposition upon the electrodes is the cause of metal overvoltage.

An Investigation of the Thermo-Electric Properties of Some Alloys of Nickel. By Harry A. Irving. Published by Rensselaer Polytechnic Institute, Troy, N. Y., June, 1926.

Ten alloys of nickel and cobalt were prepared and drawn into wire and their thermal e.m.f. curves against platinum were determined. The cobalt content varied from zero to fifty per cent. All alloys contained from one-half to two per cent manganese. Additions of cobalt decreased the thermal e.m.f. of nickel and placed inversion points in all the curves.

Alloys of nickel and molybdenum varying from zero to 30 per cent molybdenum were prepared, drawn into wire, and their thermal e.m.f. curves determined. Molybdenum increases the thermal e.m.f. of nickel up to 20 per cent Mo after which it decreases it. One per cent manganese was necessary for the successful working of the alloys, but an increase in manganese content decreased the e.m.f. of that alloy. Oxidation tests were made for both one and three hours at 1000° C. for these alloys. The molybdenum alloys withstood the oxidation better than the standard alumel and constantan elements, but not as well as chromel.

Alloys of copper with two-tenths per cent, one-half per cent, one per cent and one and one-half per cent nickel were drawn into wire and their e.m.f.'s vs. copper were found, to determine the per cent of nickel necessary to approximate the e.m.f. of the platinum vs. platinum rhodium couple at temperatures up to 400° C. By extrapolation this content was determined as sixty-three hundredths per cent nickel.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

ASSOCIATE EDITORS { JESSE L. JONES, Metallurgical
WILLIAM J. PETTIS, Rolling Mill W. J. REARDON, Foundry
W. L. ABATE, Brass Finishing CHARLES H. PROCTOR, Plating Chemical
P. W. BLAIR, Mechanical

ALKALINE COPPER SOLUTION

Q.—I have used your copper solution (alkaline) for plating steel parts, but met with little success. I get no deposit of copper whatsoever. I feel sure that some of the chemicals were old and would like to know if this could cause the trouble. I should also like to ask if it is necessary to copper plate steel parts before nickel plating?

A.—We should be pleased to have you advise us the exact formula we furnished you, and gave you adverse results. If the materials were fresh and the weights correctly proportioned and sufficient current was used to operate the solution, then you certainly should have received a satisfactory copper deposit. The reason for a non-deposit would be either a deficiency in free cyanide or an excess. If the latter, then only an evolution of hydrogen would result at the steel, but no copper deposit on it.

If the solution does not contain sufficient cyanide, the results would be no deposit. Try the solution both ways, first by adding small proportions up to 1 oz. or more per gallon of solution. On the other hand if too much cyanide, add small proportions of copper cyanide or copper carbonate with constant stirring— $\frac{1}{2}$ to 1 oz. per gallon of solution.

It is not necessary to copper plate steel before nickel plating, but it ensures a better surface for the nickel.—C. H. P., Problem 3,646.

AUTOMATIC BUFFING

Q.—We are in the nickel and copper plating business. What would be good for a buffer after nickel plating, outside of buffing wheels. We have small parts and we want a quick way of buffing them. We have a burnisher, but they are all wet and it takes time to dry them. How would small pieces of leather do in a barrel and tumble? Do you think that would bring the polish on them? We would like to know if you know of anything that would serve for this purpose, outside of burnishing.

Can copper plating be done in a cold solution?

A.—By the use of leather scraps and macerated leather in a ball burnishing barrel and the addition of some dry hydrated lime or white polishing compound reduced to a powder, you should obtain an excellent polished finish. Sole leather scraps will give the best results.

It may be advisable to speed up the rotation of the mechanical barrel to obtain the necessary speed best adapted for the mechanical polishing. You can decide this by test.

Copper plating can be done in a cold solution. It requires a stronger solution in metal and more free cyanide than is required when a good warm copper solution is used.

Furthermore the color of the copper deposit from warm or hot copper solutions is much better than from cold solutions.—C. H. P., Problem 3,647.

BRIGHT NICKEL ON COPPER

Q.—Under separate cover we are sending you three socket wrenches. One in the natural state; one dull copper finish as it comes from the tank, and the other having been scratch brushed. The one that was scratch brushed was like the dull copper before this operation.

It is necessary for us to brighten the copper in order to get a nice white nickel finish. If they are nickel plated without brightening the plating, they are very dark and dirty looking.

Is there a copper solution you can suggest that would give us the bright finish to eliminate this scratch brushing operation?

A.—To produce a bright copper deposit it is necessary to operate the copper solution warm, or better still, at a temperature of 120 deg. F. The addition of 1 oz. sodium hyposulphite per 100 gallons of solution will result in a brighter and more uniform copper deposit. If you use a few sheet lead anodes with the copper

anodes, the copper deposit will be still brighter when a little of the lead is reduced in the solution. An excellent copper solution for your purpose should approximate the following formula.

Water	1 gallon
Sodium cyanide	4 ozs.
Copper cyanide	3 ozs.
Bisulphite of soda	1½ oz.
Caustic soda	½ oz.
Sodium hyposulphite	1/64 to 1/32 oz.

Temperature as outlined; voltage 4 to 5.

It should not be necessary to scratch-brush the copper deposit on the wrenches if it is a satisfactory deposit. Your nickel solution can possibly be improved by the addition of 1 oz. sal-ammoniac per gallon. To each 100 gallons of solution, dissolve in 1 pint hot water, 6 ozs. muriatic acid and ½ oz. cadmium chloride. Stir these materials thoroughly in the solution. Bright uniform deposits of nickel will result.—C. H. P., Problem 3,648.

NICKEL ON BRASS AND ZINC

Q.—There are a few things I would like to know with regard to plating. At the shop where I am employed we have a radiator cap made up of three parts, two of them are die cast (zinc) and one part is brass. Can I plate these together in the same solution by coppering the die cast parts with a heavy coat, then putting them together with the brass and plate all with nickel? My solution consists of the following: Water, 1 gallon; single nickel salts, 8 ozs.; boracic acid, 1 oz.; common salt, 1 oz.; Epsom salts, 1 oz.; nickel chloride, 1 oz.

What is a good nickel bath for die casting? Do you use rolled or cast anodes? Is the bath kept neutral? What voltage is used on the tank?

What is used for a dip before plating, if any (like the cyanide dip on brass)?

Do die castings absorb a copper plate on them? Would they absorb if heavy? Will iron rust underneath the nickel plate if the bath contains any chloride.

A.—Your suggestions relative to nickel plating the radiator caps made up of two distinct die casting alloys and in part brass, by first copper plating the die castings heavily with copper are excellent, and will give you the desired results in nickel plating.

Your present formula for nickel solution can be used successfully in plating the caps if your procedure is carried out as outlined above.

If you meet with any trouble, then change your formula to meet the conditions in plating die castings by increasing the single nickel salt content to 10 or 12 ozs. per gallon, then adding Epsom salts up to 8 ozs. more per gallon. The addition then of ¼-oz. of 58 per cent. acetic acid per gallon will be advantageous.

The solution as outlined above will approximate the standard formula used in nickel plating die castings. Some firms use sodium sulphate instead of Epsom salts, i. e. magnesium sulphate. The latter material is preferred.

Cast nickel anodes 97-99 per cent will give you the best results. In warm nickel solutions, 110° F. with a higher nickel chloride content, 2 to 4 ozs. per gallon, rolled nickel anodes 99 per cent plus dead soft annealed, have given ideal results.

The acidity of the nickel solution when in excess can be readily neutralized by an addition of 1/16-oz. per gallon of sodium perborate. Some firms use a dilute muriatic acid dip, 1 part acid; 16 parts water. Others use a cyanide dip, water 1 gallon; sodium cyanide 4 to 6 ozs. Die castings made in part with high zinc content will absorb a very light copper deposit. Heavy deposits will resist absorption for products that would require exclusive finishing in copper, then a preliminary deposit of nickel is of great advantage to prevent absorption of the copper.

That chlorine in any form in a nickel bath causes rusting of the nickel deposit on steel is a myth. Chlorine is not deposited with nickel.—C. H. P., Problem 3,649.

NICKEL ON BRASS CABLE

Q.—We have prospects of securing a contract for nickel plating a brass armored cable like sample enclosed. It comes in 500 ft. lengths, must be done at a cost of approximately 1c. per ft., and have a bright finish.

Please give us information regarding the equipment needed to plate this. How should it be prepared for nickel? Will it need buffing after nickel?

A.—The sample has been polished previous to nickel plating and also after. Such polishing could be done by passing the cable through two cutting-down buffs, one above the other, at a speed of not less than 3,500 revolutions per minute for a 12" buff. The buffs should have an end motion so as to equalize the wearing surface; the cutting medium, tripoli composition.

By passing the cable directly through a second series of bugs following the cutting operation, it could be color buffed if found necessary.

From the bugs the cable could go direct to an electro cleaner consisting of:

Water	1 gallon
Caustic potash	2 ozs.
Soda ash 58%	2 ozs.
Tri sodium phosphate	2 ozs.
Sodium cyanide	1/2 oz.

Temperature 180° F.

The cable is the cathode as in plating; the steel tank or heavy sheet steel, the anodes. From the cleansing tank the cable should go to a cold water rinse and then direct to the nickel plating tank. The tank could be narrow in width and depth, but of considerable length. It might be possible to use a deep tank, say 6 ft. The cable passing from the water rinse to the nickel tank should go over a steel or aluminum roller or grooved pulley to hold the cable in place, and carry the current. A second roller made of celluloid or Bakelite, should be arranged at the bottom of the tank or near it upon a suitable bracket to revolve easily so that the cable can pass under and then upwards to the exit pulley or roll.

A third roll or grooved pulley should be arranged at the exit end of the tank so that the cable can be carried out of the tank to the wash water which should be heated to the boiling point. It may be necessary to use a cold water rinse before. Both entrance and exit pulleys should be connected to the negative or cathode current, and have suitable rheostat to control the current and revolve easily. Arrangement would have to be made so that the cable would be drawn through each solution at a definite speed to insure the cleansing and plating being absolutely uniform.

The mechanical features would have to be worked out by you.

If the cable has a good uniform lustre when polished and cleansed, then a final buffing after nickel plating might be avoided, with a bright nickel solution prepared as follows:

Water	1 gallon
Single nickel salts	12 ozs.
Nickel chloride	1 oz.
Sal-ammoniac	2 ozs.
Boracic acid	1 oz.
Acetic acid 65%	1/4 oz.
Cadmium chloride	4 grains

Temperature of solution 80° F., voltage 6; anodes 99 per cent plus, cast or rolled, annealed dead soft.

From these suggestions, you may form a good idea as to how to polish, cleanse and plate the cable at 1c. per ft. It is quite a problem unless you make it an entirely mechanical proposition.—C. H. P., Problem 3,651.

OXIDIZED BRONZE

Q.—On page 69 of your February issue you speak of getting a statuary bronze finish by copper plating oxidizing with polysulphide.

In our making of revolving doors, with 20 gauge or 16 gauge bronze plate overlaid with glue like another veneer ply on suitable hardwood laminated cores, the pieces are of course too large to plate and we have been giving a medium or dark oxidized finish

by first cleaning with a mild acid then rubbing dry with sand dust and applying a solution of sulphuret of potassium. After the surface is thoroughly darkened as described in your article, we reduce it to as even a color as possible by rubbing with bristle or tampico rubbing brushes and fine pumice or even cement.

What can you tell us with regard to the use of polysulphide and just what is it or do you buy it under that particular name only?

After oxidizing, we have generally coated the bronze work with a mixture of linseed oil, turpentine and beeswax, the object being to prevent staining from finger marks until the work can be erected, after which it is necessary to keep it rubbed down with a similar waxed solution of a light oil. This method has room for a great deal of improvement. We would like to know if there is any better way of protecting oxidized bronze work which has been brought to something like the color which it will naturally take in time if not polished by an abrasive, so that it will not arrive at the job streaked and striped and require complete refinishing and reoxidizing.

A.—Polysulphide gives identical results as with sulphuret of potassium. The former material contains $\frac{1}{3}$ more available sulphur than the potassium salt; therefore, is $\frac{1}{3}$ stronger. It is much cheaper in cost and comes in granular form. Its application for your purpose would be identical with the procedure you now use.

From your methods as outlined in your letter, very little changes can be advocated to produce your present results. We suggest the following, however, as a tryout.

1. Instead of using a preliminary mild acid dip, why not scour down with a sharp sand like sea sand?

2. After oxidizing as you outline and washing and drying out thoroughly, try rubbing down dry with coarse steel wool.

3. A mixture of beeswax, turpentine and oil prepared as a paste is the usual protective material for such a product as yours when lacquers are not permissible.

4. A good prepared floor wax would be an excellent material to apply to your product. It gives absolute protection against atmospheric moisture and oxidation and still is removable by usual solvents, such as benzine, benzol and carbon tetrachloride.—C. H. P., Problem 3,651.

ZINC FUMES FROM YELLOW BRASS

Q.—I wish you would write me the way yellow brass is run to avoid the dross and smoke showing. My work has always been red metal and machinery castings. I tried last month to make some yellow brass candlesticks and I must confess I made a failure of it; they were so smoky and pitted. I see some yellow brass castings come in the scrap and they look good, but remelt them over and the smoke shows up. I did finally find a large casting (scrap valve). I remelted this and it came very well. It showed a yellow skin all over the outside that is caused by iron. Now how is this content of iron mixed in so thoroughly that it shows this yellow color uniform all over. Generally a little iron gets in the metal it will show up in black spots and streaks. How is this overcome?

A.—To avoid dross and smoke in yellow brass add $\frac{1}{4}$ of one per cent of aluminum to the yellow brass mixture. This will quiet the metal, also the smoke. All mixtures high in zinc will smoke when heated to a pouring temperature, and for candlestick work, aluminum added to the yellow brass gives good results and eliminates the smoke.

The yellow skin you found one iron casting in the scrap is brass-plated material. To remove a small amount of free iron from brass a flux must be used. Lime, fluorspar and coke dust mixed makes a good flux for such work: $\frac{1}{4}$ lime, $\frac{1}{4}$ fluorspar, $\frac{1}{2}$ coke dust mixed and 2 per cent added to the metal and stirred in will remove iron.

If aluminum is objectionable 2 per cent silicon copper will also suppress zinc fumes. The silicon should be added after the copper is melted and before the zinc is added. The trouble with silicon is it cannot be used where lead is present, as it forms a silicate of lead and makes dirty castings. Where no lead is present silicon can be used in place of aluminum to suppress zinc fumes.—W. J. R., Problem 3,652.

PATENTS

A REVIEW OF CURRENT PATENTS OF INTEREST

1,624,739. April 12, 1927. **Spray Drying.** Arthur B. Jones, Plainfield, N. J., assignor to Industrial Associates, Incorporated, New York, N. Y.

The method of spray drying which comprises dispersing a fluid as a nebula, causing a convection current to traverse the zone of said nebula, leading the chilled and moisture saturated portion of the convection current from the lower end of the drying chamber, and causing the unsaturated portion of the convection current to rise and to re-enter the nebula zone to there absorb further moisture.

1,624,783. April 12, 1927. **Polishing Composition.** Alfred Bryant Fisher, New York, N. Y.

A polishing composition, which comprises an intimate mixture of finely divided metal dust, pumice and oil.

1,624,804. April 12, 1927. **Tube-bending Machine.** Thomas T. Robinson, Bridgeport, Conn., assignor to Bridgeport Brass Company, Bridgeport, Conn.

In a tube bending machine, a bending arbor having a tube receiving groove and means to hold a tube in said groove comprising a block adapted to bear against the tube wall, a clamp to embrace the arbor, tube and block, and an eccentrically mounted pin passing through the block and adapted to urge the latter against the tube.

1,624,857. April 12, 1927. **Alloy.** Clement S. Brainin, Glen Ridge, N. J., assignor to Baker & Company, Inc., a Corporation of New Jersey.

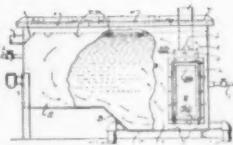
An alloy of high electrical resistance composed of not less than 75% platinum and the rest copper.

1,624,938. April 19, 1927. **Method for the Prevention of Corrosion.** Stanley Fowler, Yorkshire, and Edwin Edser, London, England.

A method of preventing corrosion of metallic surfaces which consists in covering the surface with a substantially non-acid layer consisting essentially of anhydrous neutral soap-free wool-fat in homogeneous unclouded admixture with a non-acid non-volatile thinning agent.

1,624,982. April 19, 1927. **Apparatus for Cleaning Metal Parts.** Louis Rosenberg, Milwaukee, Wis.

In a chemical solution tank for use in cleaning metal parts, the combination of a tank having hinged lids, an elevated floor at one end of the tank, a lowered floor at the other end of the tank, a sloping floor connecting the elevated and lowered floors of the tank, a heater mounted in the tank on and in spaced relation to the lowered floor and to the adjacent end of the tank and valve-controlled drain conduits opening out of the lowermost portion of the tank.



1,625,484. April 19, 1927. **Process of and Apparatus for Cleaning Metal.** Sumner Redway Mason, Wilmette, Ill., assignor to Western Electric Company, Inc., New York.

A process of cleaning a metal part, which consists in subjecting it to alternating current in an electrolyte of a solution of ferric chloride and hydrochloric acid to remove scale and rust therefrom, and thereafter as an anode to direct current in a sulphuric acid solution to remove foreign matter.

1,626,096. April 26, 1927. **Spray Gun.** Carl L. Richenbach, Yonkers, N. Y., assignor to Eclipse Air Brush Company, Newark, N. J.



A spray gun comprising a barrel, a sleeve insertible in the barrel from the front, and extending therethrough, means at the back of the sleeve for locking it in place, and a stem insertible into the sleeve from the back, the sleeve having a seat against which the end of the stem can close, a nozzle on the front of the sleeve, the sleeve having passages to convey air to the nozzle, and a trigger for operating the stem.

1,626,038. April 26, 1927. **Alloy.** Ward S. Ireland, Beloit, Wis., assignor to Lipman Refrigeration Company, Beloit, Wis.

An alloy consisting of the following ingredients in substantially the proportions specified: Tin, 95 to 97½%, and silver, 2½ to 5%.

1,626,342. April 26, 1927. **Metal-Pouring Apparatus for Centrifugal Casting Machines.** James Edgar Hurst and Edmund Bruce Ball, Kilmarnock, Scotland, assignors to Centrifugal Castings Limited, Kilmarnock, Scotland, a Company of Great Britain.

In metal pouring apparatus for centrifugal casting machines the combination of a pouring trough having a weir edge varying in height along the trough, a reservoir adapted to deliver molten metal into the trough, means for rotating the trough, mechanism for simultaneously tipping the reservoir to an extent dependent upon the speed at which the trough is rotated and means for varying the ratio of these interdependent speeds.

1,626,924. May 3, 1927. **Machine for Trimming the Edges of Bearing or Like Sections.** Charles W. Eggenweiler and William J. Fiegel, Detroit, Mich., assignors, by mesne assignments, to Bohn Aluminum and Brass Corporation, a Corporation of Michigan.

In a machine for trimming bearing or like sections, the combination with a clamping member having a concave face with a radius equal to the radius of the outer face of the final bearing or like section of a co-operating clamping member engageable with the inner face of the bearing or like section for forcing its outer face into contact with the concave face of said first-mentioned clamping member, and means for trimming the side edges of the bearing or like section while held between said clamping members.

1,627,088. May 3, 1927. **Transfer Medium for Metallizing Purposes.** William F. Grupe, Lyndhurst, N. J.

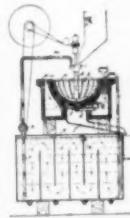
A metallic transfer medium comprising a carrier, a layer of heat releasable material disposed on a face of said carrier, metallic particles disposed on said layer of heat releasable material and a layer of heat releasable material disposed on said metallic particles.



1,627,117. May 3, 1927. **Apparatus or Tool for Applying Coating Material.** James Jarvis Preble, Newton, and Wayne B. Thompson, Winchester, Mass., assignors to Spraco Painting Equipment Company, Boston, Mass.

A spray gun, having, in combination, means to supply coating material, means to subject the same to the action of a motive agent thereby effecting the discharge of the coating material, a member through which the motive agent may be discharged supplementally upon the discharged coating material, and means independent of the member for determining the plane of the supplemental discharge.

1,627,129. May 3, 1927. **Apparatus for Washing Refuse Containing Precious Metal.** Gotthilf Unrath, Pforzheim, Germany.



An apparatus for washing refuse from sweepings containing precious metal by means of circulating and permanently cleaned water, comprising in combination a stirring cup of semispherical shape and having a central discharge opening in the bottom and radial grooves in its inner surface converging towards said central opening to conduct the heavy particles of the refuse which contain precious metal to said central discharge opening, a hollow agitator in said cup, an outer vessel enclosing said stirring cup and designed to receive the water with the light refuse particles flowing over from said stirring cup, a settling tank under said outer vessel, an overflow connecting said outer vessel to said settling tank, and means for lifting the water from said settling tank into said hollow agitator.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

NEW BLOCK COMPARATOR

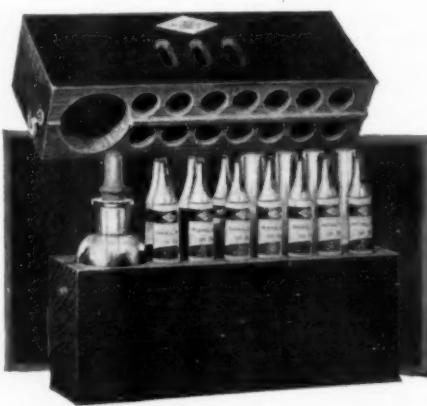
LAMOTTE BLOCK COMPARATOR (MODEL Z.N.) FOR CONTROLLING ACID ZINC PLATING SOLUTIONS

Research at the Bureau of Standards and the experience of commercial electroplaters and electrotypers during the past few years have shown that a large percentage of the troubles in nickel plating, such as pitting, cracking, curling, too hard or too soft a deposit, burnt deposits, etc., are due to improper acidity of the bath. More recent studies have shown that the same is true of acid zinc plating baths. Even slight changes in the acidity may cause marked effects upon the appearance or properties of the deposited metal.

Crude tests of acidity, such as those with litmus paper and observation of the nature of the deposit, are not sufficiently sensitive to detect such slight changes. By hydrogen ion or pH control, however, it is possible to measure quickly and accurately the slightest change in reaction.

Acid zinc solutions are usually maintained at a pH of 3.5 to 4.5, which values are covered by the range of Bromphenol Blue (pH 3.0-4.6). The Block Comparator, Model Z.N., made by the La Motte Chemical Products Company, Baltimore, Md., therefore contains a set of Bromphenol Blue color standards; a bottle of the corresponding indicator solution, with pipette and nipple; an ampoule of distilled water; and four graduated test tubes (10 cc.).

In making a measurement the top of the case is removed and used as a comparator block. Fill three of the test tubes to the mark (10 cc.) and place them in the three holes directly behind the three slots. Add 0.5 cc. of the indicator solution to the middle tube, shake and replace in the block. Place the ampoule of distilled water directly behind the middle tube and insert two of the color standards, differing by only 0.2 pH, for example 3.8 and 4.0, in the holes behind the other two tubes. Look through the three



LA MOTTE MODEL ZN COMPARETOR

pairs of tubes, holding them toward the light, and change the color standards if necessary, until the central pair of tubes exactly matches one of the other pairs, or until the color through the central pair lies between the colors of the pairs on either side. The pH of the solution can be read off directly.

PROPER ACIDITIES

In zinc baths containing aluminum salts, such as alum, aluminum sulfate or aluminum chloride, satisfactory deposits can be produced within a range of pH 3.5 to 4.5. As conditions may vary somewhat in different plants, it is best for the plater to determine from a few simple tests the pH value that is best suited for his class of work. At the start it is well to try a pH of about 4.0.

In general, if the pH is too low (i.e., the solution is too acid) the cathode efficiency is low, and the anodes are rapidly attacked when the bath is not in use. If the pH is too high, the deposits are coarse grained and likely to be dark and spongy.

In a solution containing an aluminum salt, when the pH reaches about 4.5 a white gelatinous precipitate appears. This is itself an evidence that the pH is somewhat higher than is usually desirable. In that case it is best to add acid slowly to the entire bath until, after stirring and standing for some time, the white precipitate just dissolves. The pH may then be measured and adjusted further if necessary.

In general, if the pH is too high, sufficient acid should be added to produce the desired pH. If the bath contains zinc sulfate, sulfate acid should be used; if it contains zinc chloride, hydrochloric acid should be used. If the pH is too low, add ammonia if the bath contains ammonium chloride; or add sodium hydroxide or sodium carbonate if the bath contains sodium chloride.

In most cases it will be found that the pH of the bath gradually increases, owing to the fact that the zinc anodes are slowly attacked and dissolved when the bath is not in use. It is likely therefore that some addition of acid will be required each day. Measurement of the pH will show when acid is needed, and when enough has been added to produce the most favorable deposits.

With solutions which do not contain any aluminum salt, it is possible and may sometimes be desirable, to use a higher pH, e.g., up to 5.0 or 5.5, which is beyond the range of Bromphenol Blue. If these higher values are desired, a Block Comparator containing Bromcresol Green Color Standards (pH 4.0-5.6) should be used instead of the Model Z.N. From present indications, however, it appears probable that for most purposes Bromphenol Blue will prove satisfactory.

NEW PLATING CONVEYOR

Charles F. L'Hommedieu & Sons Company of Chicago, Ill., have developed a new plating conveyor, called the Reliance. The following are the outstanding features of this machine:

- 1—Better plating at less cost.
- 2—Center line suspension.
- 3—Positive variable speed control obtained by change gear drive.
- 4—Double bus bar; can carry any current load; a feature of only the Reliance Plating Conveyor. Additional bus bars can be added to carry as great a current load as may be desired.
- 5—Solid rigid construction prevents vibration.
- 6—Bronze worm wheels and hardened steel worm; grease filled gear case.
- 7—Equipped with General Electric motors.
- 8—Constant and continuous production. Its variable speed allows adjustment of speed and of the movement of the



RELIANCE PLATING CONVEYOR

work through the tank, there being no friction wheels to slip.

- 9—Simple and easy operating.
- 10—The Reliance Conveyor carries a guarantee to do the work for which it is constructed and for which it is intended, or an offer of 30 days' trial, in which time the buyer has opportunity to test the claims.

NEW DRAW BENCH

The Waterbury Farrel Foundry and Machine Company, Waterbury, Conn., has worked out a new development in the construction of chain draw benches for drawing tubes and rods. The feature of this machine is the use of a worm gear reduction unit in the drive. The advantage of this type of drive is that it results in better finish on the work, due to minimized vibration; it is quieter and more compact. In addition, when these machines are fully equipped, they may, in many cases, be run by one man.

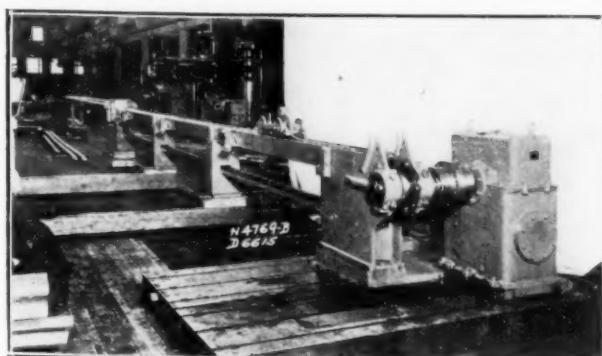
The worm gear shaft and the sprocket shaft are each extended to outrigger bearings and all drive parts are mounted on a common baseplate which is anchored to a concrete floor or foundation."

The tongs are of the alligator type and swivel on the front axle of the tongs carriage. They are linked to the rear axle which carries a counterbalanced hook and the rear wheels.

The hook is manually engaged with the chain at the start of the draw and the open tongs are closed by the pull of the chain and hook through the previously mentioned linkage. The continued pull traverses the front carriage and thus starts the draw. At the end of the draw, the recoil caused by the sudden release of the load, lifts the counterbalanced hook, opens the tongs, and releases the work.

On heavy benches the hook is operated by a hand-lever. The

tong carriages are steel castings and the hooks alloy steel. These machines are built in six sizes with capacities ranging from 6,000 pounds to 50,000 pounds pull; the smallest weighs 8,275 pounds and the largest 47,000 pounds."



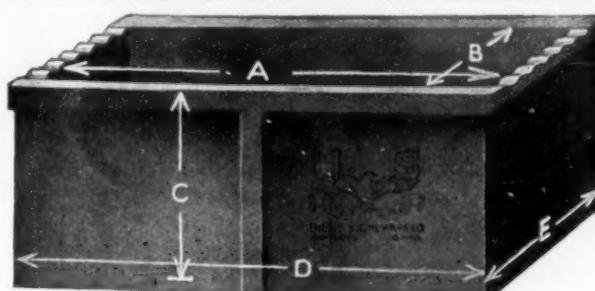
WATERBURY FARREL NO. 1 CHAIN DRAW BENCH WITH TUBE EXTENSION.

RECTANGULAR ACID TANKS

The U. S. Stoneware Company of Akron, Ohio, has put out a new line of rectangular stoneware tanks for acids. They are specially recommended for photo-engraving, electrotyping, lithographing, electro-plating and zincing work. They are said to be non-porous, close grained, thoroughly vitrified and well glazed. The following advantages are given.

1. They are made in one piece without seams or joints.
2. The material does not become slimy or rust, peel, flake, chip, stain, etc.
3. The tanks have rounded corners and have a smooth glassy glaze and a light color so that they can easily be kept clean.

Standard tanks are made without outlets but outlets can be provided if desired. Lugs to hold false bottoms can also be provided.



U. S. STONEWARE RECTANGULAR TANK

HANDLING AND STORAGE OF ACIDS

A new and more economical method of purchasing and storing acids, pickling, galvanizing and plating solutions in hard rubber-lined tanks should be of great interest to users of these corrosives.

The large manufacturers of hydrochloric acid have effected a decided saving to consumers by shipping in rubber-lined cars. Consumers favor this method because they may now obtain any size storage capacity through the use of ace patented hard rubber-lined steel containers. Two of these tanks (illustrated) have just been installed in the galvanizing department of one of the large steel manufacturers and are 13' high and 6½' in diameter—the capacity approximately 3,200 gallons.



LARGE RUBBER TANK LINING

The ace patented construction (illustrated) permits expansion and contraction due to quick temperature changes. Recent tests indicate that this method provides a surface which readily absorbs shocks without danger of fracture to the lining.

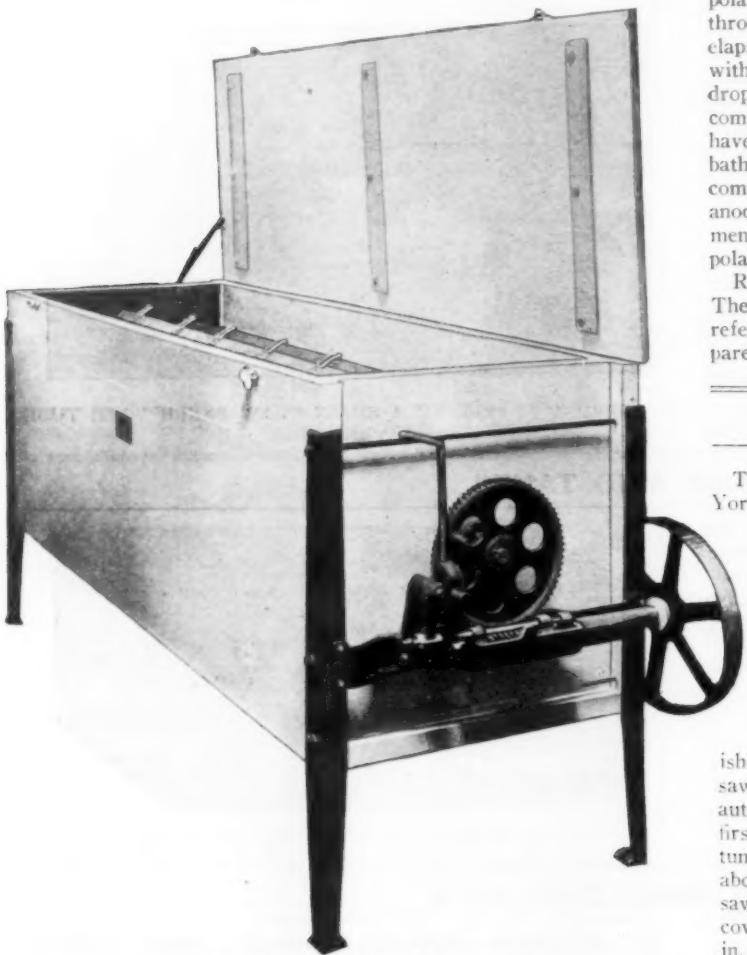
Relatively high temperatures can be employed with safety, installations handling acid solutions at 200° F. being possible where these lined tanks are used. The American Hard Rubber Company of New York which has been supplying ace hard rubber-lined tanks for galvanizing, pickling and plating tanks for several years is now making a feature of this improved type of tank lining.

PERMANENT FLEXIBLE LACQUER

It is a well known fact to finishing men that lacquer enamels and lacquers can be made temporarily flexible so that metal products finished with them can stand the bending test for a few days or a week. After this time they become so brittle that if the product is bent the finish chips off. On the other hand lacquer enamels have been produced which are flexible but they in turn are so soft that they can be readily removed from the surface with a fingernail and therefore the finish produced with them can stand no abrasion or wear. The latest development of the Roxalin Flexible Lacquer Company of Long Island City, N. Y., has been a line of clear lacquers and lacquer enamels which are said to have perfect adhesion to brass, aluminum, white metal, die casting metal, glass and nickel silver; which have permanent flexibility and when the finish is bent it will not clip.

NEW BURNISHING BARREL

Smith, Richardson Company, Attleboro, Mass., have developed a new burnishing barrel called the Imperial Multiple Compartment machine, designed to take care of larger



SMITH-RICHARDSON BURNISHING BARREL.

and heavier work than usually burnished in this type of equipment.

It is particularly applicable to electric light fixtures and will handle work, either castings or stampings, up to 18 inches in diameter.

TESTING PLATING SOLUTIONS

The Haring cell for the measurement of resistivity, polarization and throwing power of electro-plating solutions as developed by H. E. Haring of the Bureau of Standards, is being made by the



THE HARING CELL

State Manufacturing Company of Chicago, Ill. This cell was described in principle in THE METAL INDUSTRY for May, 1926, page 194.

The cell consists of a hard rubber box with an anode at one end, a cathode at the other and two pieces of gauze between them, thus dividing the cell into 3 compartments. Measurement of polarization can be made by first passing the desired current through the solution in this box and after a few minutes have elapsed, measuring the voltage drop across the anode compartment with a voltmeter or potentiometer. Then measure the voltage drop across the middle compartment and then across the cathode compartment. The readings are repeated at intervals until they have become constant. The values are recorded, together with the bath temperature at the time. The voltage drop across the anode compartment minus that across the middle compartment is the anode polarization. The voltage drop across the cathode compartment minus that across the middle compartment is the cathode polarization.

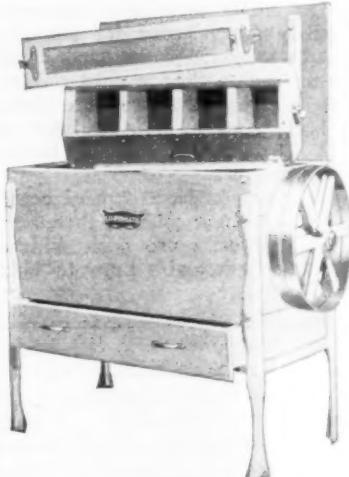
Resistivity and throwing power can also be measured simply. The explanation of the methods can be found in the above reference in THE METAL INDUSTRY and also in the literature prepared by the State Manufacturing Company.

TUMBLING BARRELS

The Lupomatic Tumbling Machine Company, Inc., of New York is making an improved motor-driven polishing machine (tumbling barrel type). It is made in seven sizes with one to seven compartments.

The illustration shows a combination machine, which cuts down burrs on metal parts, polishes and separates the sawdust from the parts automatically. To do this, first close the cover and tumble the pieces for about a half hour with sawdust. Then open the cover, leaving the screen in, and tumble for about 10 minutes. The sawdust will fall out into the drawer shown at the bottom and the articles will be clean.

The Lupomatic Company also makes special tumbling barrels to order to suit any kind of special conditions.



COMBINATION MACHINE

NEW CLEANING COMPOUND

The Magnus Chemical Company, Inc., of 718 Atlantic Avenue, Brooklyn, N. Y., through its Chemist, Dr. R. W. Mitchell, has recently developed a new material for removing tripoli and buffing compounds from metals, which, it is claimed, has proved through practical demonstration to have exceptional merit. It is unlike any other known compound and is based on a new principle of cleaning.

DIXON COMPANY 100 YEARS OLD

A Tale of Yesterday, Today and Tomorrow, by Floyd W. Parsons was written on the occasion of the 100th anniversary of the Joseph Dixon Crucible Company, Jersey, N. J. This is a recital of business victories and tribulations and sets forth the business philosophy that has brought the Joseph Dixon Crucible Company through 100 years of service. This company is now known all over the world to be a leading manufacturer of graphite products including crucibles, facings, pencils, paints, lubricants, etc.

EQUIPMENT AND SUPPLY CATALOGS

Grinding Coal. Hardinge Company, York, Pa.

Electrical CO., Meters. Leeds and Northrup Company, Philadelphia, Pa.

"The Building You Want." Standard Erecting Corporation, New York.

Ball Burnishing Machines. Baird Machine Company, Bridgeport, Conn.

Ball Burnishing Barrels. The Henderson Bros. Company, Waterbury, Conn.

Self-Cleaning Portable Filter. Belke Manufacturing Company, Chicago, Ill.

Alemite Industrial Lubricator. Alemite Lubricator Company, Chicago, Ill.

Sirocco Blowers for Oil Burners. American Blower Company, Detroit, Mich.

Guaranteed Electric Motors. The Fuerst-Friedman Company, Cleveland, Ohio.

Crown Special Fire Brick. Laclede-Christy Clay Products Company, St. Louis, Mo.

Hausfeld Metal Melting Furnaces. Campbell-Hausfeld Company, Harrison, Ohio.

"Why Speakman Adopts Chromium Plating." Speakman Company, Wilmington, Del.

Five Years of Downtown Health Protection. Beekman Street Hospital, New York.

Alcumite. An acid resisting aluminum bronze. The Duriron Company, Dayton, Ohio.

Zinc Roofing and Siding for Industrial Buildings. New Jersey Zinc Company, New York.

"250 Pounds of Steel Every 20 Minutes." Ajax Electro-thermic Corporation, Trenton, N. J.

Barrels for Wet Grinding and Polishing. The Henderson Bros. Company, Waterbury, Conn.

Certified Plating Performance. Belke salt spray test. Belke Manufacturing Company, Chicago, Ill.

Mechanical Installation of Electric Motors and Control. General Electric Company, West Lynn, Mass.

Functions of the Office Manager. Policyholders' Service Bureau, Metropolitan Life Insurance Company.

Dry Grinding with the Hardinge Conical Mill and Reverse Current Air Classifier. Hardinge Company, York, Pa.

Melrock Spray Booths. Painting and spray finishing equipment. Mellish-Hayward Company, Chicago, Ill.

Smithlite. The strongest light metal and the lightest strong metal. Smithlite Castings Corporation, Buffalo, N. Y.

"500,000 Pounds of Steam Per Hour from One Unit." International Combustion Engineering Corporation, New York.

Wire Cloth. Catalog No. 26. A feature of this catalog is the new product-gasketed filter cloth. Newark Wire Cloth Company, Newark.

"What Governs Your Selection of Pump Rods?" A discussion of the use of Monel metal for these parts. International Nickel Company, New York.

International Nickel Publications. Chrome Nickel Steel in Special Track Work; 10 Answers to Casting Problems (gray iron). Internal Nickel Company, New York.

Duriron Publications. Centrifugal Pump No. 40; Tank Outlets and Steam Jets; Reciprocating Pumps; Valves, Cocks and Ejectors. The Duriron Company, Dayton, Ohio.

Achern-Jahrbuch. 1926-1927. This is an almanac for the exposition which will take place in Essen, Germany, June 7-19, 1927, and will cover all types of chemical apparatus.

General Electric Publications. Shoe-type Solenoid Brakes; Hand Starting Compensators; Type MT Control Equipment; Drum Type Controller Equipment; Squirrel Cage Motors; Automatic Starting Compensators. General Electric Company, Schenectady, N. Y.

ASSOCIATIONS and SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

TESTING MATERIALS SOCIETY

HEADQUARTERS 1315 SPRUCE STREET, PHILADELPHIA, PA.

The 30th annual meeting of the Society will be held at the French Lick Springs Hotel, French Lick, Ind., June 20-24. A report of this meeting will be published in our July issue.

The Marburg lecturer for this year will be Dr. George L. Clark, professor of Applied Chemical Research and Divisional Director of the Research Laboratory of Applied Chemistry in the Massachusetts Institute of Technology. He will speak on "X-rays in Industry."

NEW OFFICERS

The following have been nominated for the new officers of the Society.

For President: **H. F. Moore**, Professor of Engineering Materials, University of Illinois, Urbana, Ill.

For Vice-President: **T. D. Lynch**, manager, Materials and Process Engineering Department, Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa.

For Members of Executive Committee: **F. O. Clements**, Director of Research, General Motors Corporation, Detroit, Mich.; **W. H. Klein**, general superintendent, Dixie Portland Cement Company, Richard City, Tenn.; **F. C. Langenberg**, metallurgist, Watertown Arsenal and Metallurgist, Climax Molybdenum Company, New York City; **F. N. Speller**, metallurgical engineer, National Tube Company, Pittsburgh, Pa.

DUDLEY MEDAL AWARD

The first Charles B. Dudley medal, established by the Society for recognition of meritorious papers on research in engineering materials will be awarded to Dr. D. J. McAdam, Jr., metallurgist U. S. Naval Engineering Experiment Station, Annapolis, Md., for his paper on "Stress-Strain-Cycle Relationship and Corrosion-Fatigue of Metals," presented at the annual meeting of the Society last year.

SOIL CORROSION CONFERENCE

J. L. Christie, metallurgist, Bridgeport Brass Company, Bridgeport, Conn., has been appointed representative of the Society at a Soil Corrosion Conference, held under the auspices of the U. S. Bureau of Standards.

DIE CAST METALS AND ALLOYS

A meeting of Sub-Committee XV of Committee B2 on Die Cast Metals and Alloys will be held on June 22.

Six producers have advised that their dies are complete, and in certain cases, shipment of specimens to the laboratories is promised before the end of May. This will make it possible for the committee to have some test data for consideration at the June meeting and certain modifications in the test program may prove to be desirable. Mr. Townsend will present complete drawings for a combination Izod Charpy impact machine suitable for die castings.

ELECTRO-CHEMICAL SOCIETY

HEADQUARTERS, COLUMBIA UNIVERSITY, NEW YORK.

The New York Section of the American Electrochemical Society held a meeting at the Chemists' Club, on May 13, 1927, and elected officers for 1927-1928. C. L. Mantell, of Pratt Institute, Brooklyn, is chairman, and F. F. Farnsworth, Bell Telephone Laboratories, New York, is Secretary.

ASSOCIATION OF BRASS MANUFACTURERS

HEADQUARTERS: CITY HALL SQUARE BUILDING, CHICAGO, ILL.

A communication has been received from the National Association of Brass Manufacturers to the effect that false rumors are going around that the lists in the new official catalog are not being used. The fact is that a number of leading manufacturers are using and expect to use the official catalog and the lists.

Two-thirds of the original issue of this catalog have been sold

and generally distributed throughout the United States and Canada. When this issue is exhausted, it will not be possible to obtain any additional catalogs. Hence, those who desire these catalogs should provide themselves before the original run is completely exhausted.

AMERICAN WELDING SOCIETY HEADQUARTERS, 29 W. 39 STREET, NEW YORK

At the Annual Dinner of the American Welding Society held in New York on April 28, President F. M. Farmer announced the donation of an award, the gift of Samuel Wylie Miller, to be presented by the Society annually in appreciation of work of outstanding merit in advancing the art and science of welding. The award is a gold medal, which will be known as the Miller Medal.

Mr. Miller has been one of the outstanding figures in the advancement of welding ever since its commercial inception. He is a past president of the American Welding Society, and a prominent and active member of the Society of Mechanical Engineers, American Institute of Mining and Metallurgical Engineers and other scientific and engineering

organizations. He has for a long time been noted for his energetic insistence upon high quality and dependable workmanship and upon the development of welding by all processes along lines scientifically well founded. Mr. Miller is Consulting Engineer, Union Carbide and Carbon Research Laboratories, Inc.

In establishing this award, the details for the administration of which are not yet decided upon, Mr. Miller's object is to promote an appreciation of better welding and to encourage the study of those fundamentals which will lead to raising the quality of work done by the average operator.

In accepting the administration of this award on behalf of the American Welding Society, Mr. Farmer outlined briefly the history and ideals of its donor, and expressed himself as being particularly gratified that during his administration the Welding Society should be granted the privilege of managing such an important contribution to the improvement of the welding industry.

AMERICAN ELECTRO-PLATERS SOCIETY

NEWARK BRANCH,

CARE OF ROYAL F. CLARK, P. O. BOX 201, NEWARK, N. J.

The Newark Branch of the American Electro-Platers' Society held its 9th annual banquet at Achtel-Stetters Hall, Newark, on Saturday, April 30th, 1927. The educational session which began at 3 P.M., was attended by 125 members and guests. The papers presented were exceedingly interesting and brought out considerable discussion.

1. The Production of a Rust Proof Antique Flemish Iron Finish upon Wrought, Malleable, Cast Iron and Steel, or Imitation thereof on Non-Ferrous Metals, by C. H. Proctor.
2. The Coloring and Antique Finishing of Brass and Bronze Wares, by T. Gardner and F. McStocker.
3. Plating in Japan, by A. P. Munning, 2nd.
4. Accuracy, by Geo. B. Hogaboam.
5. Discussion on the Manufacture of Laquers, by Dr. Burgess.
6. Platinum Plating, by H. H. Smith.
7. Chromium Plating, by O. F. Carlson.
8. Applications of Chromium Plating, by Dr. Wm. Blum.
9. Remarks, by Geo. Gehling.

The banquet was held in the large ball room and was attended by 463 members and guests. Twenty-five door prizes were distributed to the lucky ones who drew the right numbers. The winners

had their choice of the following prizes. Five dollar gold pieces of which there were twenty distributed; electric reading lamp; book ends; fishing reel; electric train transformer; gold ring; automobile horn; shoe buckles; hot water bottle.

The entertainment consisted of songs, and the performance of a "magician" with "marvelous" tricks which were exceedingly "mystifying."

The entertainment was concluded by dancing which closed another successful annual open meeting of the Newark Branch.

The Branch held its May business meeting on the 20th, with 27 members and 1 visitor present. Minutes of the previous meeting were approved as read.

The committee appointed by President George Onksen, to draw up a modification of the Associate membership clause, Part 2, Article 2, Section 3 of the Constitution and By-laws, allowing a broader scope for the admission of associate members, reported on their new clause, and the matter will be presented to the Toledo Convention for ratification.

Samuel R. Taylor was given a rising vote of good will and wishes for success with his firm which is moving its factory to Providence, R. I. Mr. Taylor has been with the Gorham Company several years and is going with them.

The election of officers for the ensuing year resulted as follows: President, Charles H. Bohler; Vice-President, George W. Wagner; Secretary-Treasurer, Royal F. Clark; Librarian, Samuel Glickenshaus; Sergeant-at-Arms, Alfred Vaughan.

Trustees: George W. Onksen, Frank Dressel, Wm. De Voti. Delegates to the Toledo Convention: Philip Sievering, Oliver J. Sizelove, Horace H. Smith. Alternates: Fred Groh, Roy Stout.

NEW YORK BRANCH,

HEADQUARTERS, CARE OF RALPH LIGUORI,
127 VANDERBILT AVENUE, BROOKLYN, N. Y.

The following officers were elected for the coming year. President—Frank J. MacStocker.

Vice-President—Arthur Grinham.

Secretary-Treasurer—Ralph Liguori.

Recording Secretary—Thomas A. Gardner.

Librarian—Elias Schorr.

Sergeant-at-Arms—Ben Nadel.

Asst. Sergeant-at-Arms—Charles Haushalter.

Trustees: William Fisher, Joseph Manger, Fred Haushalter.

Delegates to Toledo: F. J. MacStocker, George Wilson, Philip Morningstar.

Alternates: William Fisher, Arthur Grinham, Anthony Kuechel.

LIGHTING EQUIPMENT ASSOCIATION

HEADQUARTERS, GRAYBAR BUILDING, NEW YORK

A meeting of the Stamping and Parts Manufacturers' Group of the Artistic Lighting Equipment Association was held at Association Headquarters in the Graybar Building, New York City, on Thursday, April 21, 1927. J. Wm. Schulze, president of Alfred Vester Sons, Inc., Providence, R. I., was elected to head this group.

The Exterior Lighting Equipment and Lantern Manufacturers' Group of the Artistic Lighting Equipment Association at a meeting in New York City, April 21st, elected George J. Klein, president of the Novelty Lighting Corporation, Cleveland, Ohio, permanent chairman of their group.

The Board of Directors of the Artistic Lighting Equipment Association, Fred R. Farmer presiding, held its first meeting in the new headquarters of the Organization in the Graybar Building, New York City, April 22nd, with a luncheon at the Hotel Commodore.

The association is increasing its activities in several directions. An Association Emblem Promotional Campaign has been instituted. It is planned to feature a code of ethics and fair trade practices. Cost accounting by the industry is being encouraged.

In line with the policy recommended by Herbert Hoover, secretary, United States Department of Commerce, that trade organizations in the same field of endeavor consolidate, the better to unify and simplify their operations, the Artistic Lighting Equipment Association has absorbed the National Association of Lighting Equipment Dealers.

INDUSTRIAL ADVERTISERS ASSOCIATION
HEADQUARTERS CARE OF PAUL TEAS, 629 EUCLID AVENUE,
CLEVELAND, OHIO.

The 1927 convention of the National Industrial Advertisers Association will be held in Cleveland, Ohio, June 13-15, 1927.

Almost 75 per cent of last year's total was reserved, at the time of going to press.

Those interested are urged to communicate at once with the Secretary at the address noted above, as the number of spaces for sale is definitely limited.

Personals

HORACE H. SMITH

Horace H. Smith will be a delegate from the Newark Branch to the annual meeting of the American Electro-Platers' Society in Toledo, Ohio. He is one of the most active members of the society and one of the leaders in the Newark Branch.

Horace H. Smith was born in Bloomfield, N. J., and educated in the Bloomfield Public Schools. After graduation he went with the firm of Tiffany and Company, silversmiths, with whom he has been connected for the past twenty-five years. He now has charge of the plating department and experimental work. Mr. Smith was the organizer of the Newark Branch of the American Electro-Platers' Society, and was its first president. He acted as chairman of the Convention Committee for 1926, being in full



HORACE H. SMITH.

general charge of the activities. He is also a past supreme vice-president of the National Society.

Mr. Smith has missed but few of the conventions and has been a very active worker for the Newark Branch.

ZINC SPECIALISTS OPEN OFFICE

J. A. Singmaster, general manager Technical Department, and F. G. Breyer, Chief of Research resigned their positions with the New Jersey Zinc Company, as of May 1, 1927 and have opened a consulting office at 1640 Graybar Building, 420 Lexington Avenue, New York.

Mr. Singmaster's service of twenty-seven years with the Zinc Company embraced various positions in its large plants at Palmerton, Pa., of which he was General Superintendent from 1912 to 1917, leaving that position to become General Manager of their Technical Department.

Mr. Breyer was with the Company for seventeen years, first as Chief of the Testing Department, and for the last ten years as Chief of the Research Division.

Mr. Singmaster and Mr. Breyer have made numerous improvements in the manufacture of zinc products and in the properties of the products themselves. Among their inventions best known in the trade are those covering light resistant lithopone which is the basis of the vastly increased use of this pigment; formula for such light resistant lithopone in exterior paints, now widely advertised and used; fine particle size oxide of zinc for the rubber manufacturer; and the mechanical furnace for the manufacture of zinc oxide, which has made possible recoveries of zinc from ore and quality of product hitherto unapproached.

In addition to their process work they are familiar with the varied uses of this extensive line of products. This has brought them a large acquaintance in the trade, and a knowledge of many of the problems in paint, rubber, plastics, metal and other applications connected with these products.

Their successors with the New Jersey Zinc Company have not as yet been appointed.

W. D. GOLDSMITH

W. D. Goldsmith, elected a director of the American Foundrymen's Association for a three-year period, is treasurer and general manager of the C. A. Goldsmith Company of Newark, N. J., manufacturers of machinery castings of brass. Mr. Goldsmith received his formal education and technical training at Princeton and Lehigh Universities. He has been very active in the work of local foundry associations, serving for several years as vice-president of the Metropolitan Brass Founders' Association and has been vice-president of the Newark Foundrymen's Association. Mr. Goldsmith is also vice-president of the Port Newark National Bank and a member of Essex Club of Newark, the Newark Athletic Club, and the Rotary Club of Newark.



W. D. GOLDSMITH.

Edward B. Davidson is now connected with Denny, Hilborn & Rosenbach, Inc., Philadelphia, Pa., manufacturers of lacquers and enamels.

R. A. Nelson, formerly with the Andes Range & Furnace Corporation, in Geneva, New York, is now with the Ferro Enamel Supply Company, of Cleveland, Ohio.

Robert T. Kent, until recently superintendent of Prison Industries, State of New York, has been appointed to the position of general manager of the Bridgeport Brass Company, Bridgeport, Conn.

A. H. Graham and George B. Hogaboom both of the Hanson and Van Winkle Company, Newark, N. J., have been elected members of the Electro-Platers and Depositors Technical Society of England.

Samuel Frankel has been appointed chief metallurgist of the Niagara Falls Smelting and Refining Company, Buffalo, N. Y. He was for many years chief metallurgist and works manager of Alloys & Products, Inc., New York.

J. M. Price, president of Electro-Metallurgical Sales Corporation, 30 East Forty-second Street, New York, sailed April 5, on the Berengaria for an extended vacation in Europe. Mr. Price will leave Europe for home on or about June 15.

Joseph J. Lockwood has been appointed vice-president in charge of the Buffalo Branch of the American Brass Company to take the place of George H. Allen. Mr. Lockwood has been manager of the Buffalo Branch under Mr. Allen for several years.

H. W. Hardinge, president of the Hardinge Company, New York, has been awarded the Edward Longstreth Medal by the Franklin Institute of the State of Pennsylvania for his invention of a rotary air classifier, known as the Hardinge Reverse Current Air Classifier.

Royal D. Malm has been appointed western District Sales Manager, of the Lincoln Electric Company, with headquarters at Chicago. Mr. Malm is an engineering graduate from Case School of Applied Science, Cleveland, Ohio, class of 1912. For the past year Mr. Malm has had charge of Lincoln sales in the automotive industries with headquarters in Detroit.

L. W. Olson, factory manager, Ohio Brass Company, Mansfield, Ohio, has been appointed a member of the Committee on Metals Utilization of the American Foundrymen's Association, to study the prevention of waste in the foundry industry. He is chairman of the sub-committee on Non-Ferrous Metals.

S. E. Conybear, advertising manager of the Armstrong Cork Company of Lancaster, Penna., and president of the Association of National Advertisers, has been elected a member of the Board of Directors of the Audit Bureau of Circulations of which THE METAL INDUSTRY is a member. He will fill out the unexpired term of B. H. Bramble.

William B. Senseman has been appointed Pacific Coast District Manager for Combustion Engineering Corporation, Raymond Bros. Impact Pulverizer Company, Ladd Water Tube Boiler Company and Heine Boiler Company, all subsidiaries of International Combustion Engineering Corporation. Mr. Senseman has been associated with Raymond Brothers Impact Pulverizer Company for the past 15 years and since 1917 has represented that organization on the Pacific Coast. The new

consolidated offices are located in the Subway Terminal Building, 417 South Hill St., Los Angeles, California.

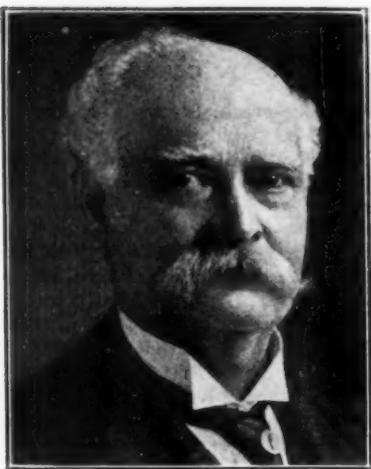
H. A. Schwarz, formerly manager New York office of Paasche Air Brush Company of Chicago, has become an officer of the Superior Spray Company, 130-132 W. Third Street, New York City. He will be in charge of the management of a complete line of spraying equipment, spray cabinets, art brushes, compressors, motors, air filters, pressure paint equipment and portable units; also repair work for all equipment.

George W. Allen, vice-president of The American Brass Company, Waterbury, Conn., has resigned to become the general manager of the Michigan Copper and Brass Company, Detroit, Mich. Mr. Allen has been with the American Brass Company for over thirty years. He was in charge of the company's plants at Buffalo and at Toronto, and prior to this position he was in charge of the company's plant at Kenosha, Wis. He joined the American Brass Company in 1894 at the Torrington plant. He takes up his new duties in Detroit on July 1st.

Obituaries

FRANCIS J. CLAMER

Francis J. Clamer died at his home in Collegeville, Pa., on May 16, 1927. He was the founder of the Ajax Metal Company, Philadelphia, Pa., and the father of G. H. Clamer, now president and general manager of that company.



FRANCIS J. CLAMER

and house furnishing business and then in the manufacture of metals.

Mr. Clamer was the first, or at least one of the first investigators to recognize the value of lead as an addition to the copper-tin alloys, previously used almost exclusively for journal bearings. He was the originator of the very largely used 80-10-10 bearing metal, which he called Ajax metal. Dick in England about the same time developed the well known 80-10-10 phosphor bronze. Some of the critics at that time went so far as to call the new metal a fraud, in that the very high grade and long used copper-tin alloys were debased by the addition of lead. Time has fully confirmed the great value of lead as an addition to the copper-tin alloys used in the service of bearings.

Dr. Dudley, long deceased, but then Chemist of the Pennsylvania Railroad, by exhaustive experiments, later proved the desirability of increasing the lead content beyond 10 per cent. Because of technical difficulty encountered in the foundry (liquation of lead), he was unable to produce alloys having a lead content in excess of 15 per cent. Later, in 1900, through the study of the microstructure of copper-tin-lead alloys, G. H. Clamer discovered the underlying principle involved for the production of alloys having a much higher lead content than 15 per cent. This discovery led to the production of the series of copper-tin-lead alloys known as Ajax Plaster Bronze, having lead content as high as 30 per cent.

All four of the alloys above mentioned still have their respective fields of usefulness. Namely, Phosphor Bronze Bearing Metal containing approximately copper 80%, lead 10%, tin 10% and containing a fraction of a percent of phosphorus; Ajax metal, approxi-

mate composition copper 80%, tin 10%, lead 10%; E x B Metal, composition copper 77%, tin 8 percent, lead 15%, containing a small amount of phosphorus; and the Ajax Plastic Bronze series of alloys ranging in composition copper 65 to 73%, tin 5 to 7%, lead 20 to 30%. It is now a well established fact that the most desirable alloy to use in the service of bearings is the one having the highest lead and the lowest tin content consistent with the service requirements as to load to be carried, or the foot pounds of pressure exerted by pounding. Francis J. Clamer interested a number of men in his alloy who furnished a small amount of capital, and this resulted first in the organization of the Elkins Manufacturing Company and later The Ajax Metal Company.

Immediately after his son's graduation from College at 22 years of age, Francis J. Clamer retired (1897) and G. H. Clamer took up the technical work at the company. Upon his retirement he relinquished all activities in connection with the metal business and devoted his attention to farming and horticulture, and the development of Collegeville, Pa. He remained, however, a stockholder and a director of the company at the time of his death.

FERDINAND GRIMM

Ferdinand Grimm, vice-president of the Buffalo Wire Works Company, Inc., located at Buffalo, N. Y., died Sunday, April 24, at his home, 1098 Ellcott Street, after a long illness.

Mr. Grimm was 61 years old—born in Heimstetten, Hohenzollern, Germany, February 7, 1866—and came to America at the age of 18 years. Shortly after he settled in Erie, Pennsylvania, and secured a position in the hardware business with the firm then known as Mehl & Sapper. After working behind the counter, and becoming acquainted with the hardware merchandise, he was sent on the road by this firm as traveling representative to solicit business in various parts of Pennsylvania and New York State. His itinerary included the City of Buffalo—and the firm of Scheeler's Sons, as it was then known. After calling on Scheeler's Sons for some years, his ability as a salesman was quite readily recognized, and he was given an opportunity to try his hand in the sale of wire goods for this firm.

His conscientious effort and honest methods soon won for him a host of friends and admirers among the customers whom he visited regularly. Constantly increasing the sale of wire products of Scheeler's Sons—who in 1903 were incorporated under the name of Buffalo Wire Works Com-



FERDINAND GRIMM

pany—he was admitted into the firm as director and Vice-President, and was also appointed general manager of their plant at Buffalo and the branch at Philadelphia.

Mr. Grimm was also President of the Buffalo Galvanizing and Tinning Works, Inc., a subsidiary of the Buffalo Wire Works Company, as well as President of the Security Savings and Loan Association of Buffalo. He was a prominent figure at nearly every hardware convention, and was widely known from coast to coast in almost all lines of business.

Surviving Mr. Grimm are his widow, Rose Scheeler Grimm, and one daughter, Mrs. Leonard Gentsch.

GEORGE W. KELLOGG

George W. Kellogg, founder of the Kellogg Manufacturing Company, of Rochester, N. Y., died recently at his home, 1119 Monroe Avenue, Rochester. Mr. Kellogg was born in Ripon, Wis., on August 4, 1857. He spent his early years in the West. In 1881 he came East and operated one of the largest brass mills in Winsted, Conn. For a number of years, Mr. Kellogg engaged in the manufacture of brass goods, such as curtain fixtures and shade hardware. During 1886 and 1900, when glass and metal hospital furniture was first made and put into use among the hospitals, Mr. Kellogg invented and patented the first pressure sterilizer which met with ready approval from many of the leading hospitals in the country. Around 1900, when the pneumatic tire was first utilized, he invented a compound air pump for use in surgical work. The pump was first introduced and tested at a hospital meeting in Bridgeport, Conn., resulting in its adoption throughout the country. He disposed of his sterilizer and hospital equipment interests to the Wilmet-Castle Company of this city, and in 1903 established the Kellogg Manufacturing Company. Failing health compelled Mr. Kellogg's retirement from active business in 1917. In 1885 he married Isabel Schuyler, whom he leaves. He also leaves a daughter-in-law, Mrs. Stella D. Kellogg; a granddaughter, three brothers and a sister.

CHARLES H. MCKENNA

Charles H. McKenna passed away Monday, May 9th, at his home in Pittsburgh, Pa., after several months of illness. His loss is keenly felt by all who had the good fortune to know him and who were inspired with his true spirit of friendship and kindly disposition.

He was active in business, serving as Vice-President of the McKenna Brass & Manufacturing Company, President of McKenna Investment Company, Vice-President of the McKenna-Horix Manufacturing Company, Managing Partner of McKenna Brothers, and Director of the Duquesne National Bank, and also of the Vanadium Alloys Steel Company. He was a member of many clubs, and leaves, besides his widow, nine children (three girls and six boys), his mother, six brothers and one sister.

The McKenna Brass & Manufacturing Company was established in 1856 by the father and uncle of the present generation of seven sons, of whom C. H. McKenna was the fourth. The firm in 1856 was known as the A. & T. McKenna and later changed to McKenna Brothers Brass Company, and in 1917 they incorporated under the name of McKenna Brass & Manufacturing Company.

PROFESSOR ADOLF MIETHE

Professor Adolf Miethe, whose announcement that he had found a method of changing elements and had succeeded in converting mercury into gold startled the whole world, died suddenly on May 6th, of heart disease, following a minor operation. The interest of the general public in the experiment was lessened by the information that the cost of thus producing gold was more than \$2,000,000 a pound.

Some doubt has been cast on the value of the experiment. In the fall of 1925, Professor H. H. Sheldon, chairman of the Department of Physics of New York University, and Roger S. Estey, instructor in that university, duplicated with funds supplied by *The Scientific American*, Dr. Miethe's experiment as described in detail by him. Their exhaustive tests brought no results and they expressed the belief that the reason Dr. Miethe had found gold was that he had used Spanish mercury which contains a small amount of gold. Other scientists made the same criticism.

P. W. KROMER

P. William Kromer, Buffalo District Manager, Air Reduction Sales Company, died at the Buffalo General Hospital, May 21, aged forty-seven years, following an illness of five weeks.

Mr. Kromer had been identified with the oxyacetylene industry for nearly twenty years, of which eleven years were with the Air Reduction Sales Company. Immediately prior to his connection with the Air Reduction Sales Company in 1916, he was the local manager of the Niagara Oxygen Company. His previous experience had been with the Searchlight Company and other producers of gases, and as manager of a job welding shop in Binghamton, N. Y.

Mr. Kromer was a member of Buffalo Consistory, Ancient Accepted Scottish Rite, Ismailia Temple, Occidental Lodge 766, F. & A. M., Mystic Circle Lodge 520, the Buffalo Rotary Club, the Greater Buffalo Advertising Club, the Buffalo Chamber of Commerce, the Buffalo Athletic Club, the Central Railway Club, the American Welding Society, the Erie Downs Golf and Country Club, and the West Side Business Men's Association.

Mr. Kromer is survived by his widow, Mrs. Grace L. Hogg Kromer, and his son, Norman W. Kromer. The funeral was held May 24, at the family home, 505 Breckenridge Street, under the auspices of Occidental Lodge.

JOHN A. MORTON

John A. Morton, 69, assistant foreman of the brass foundry, General Electric Company, Schenectady, N. Y., died at his home, 427 McClellan Street, Schenectady, on March 27 after a long illness of heart trouble. Mr. Morton was born in above city and had always lived there. He had many years been in the employ of the company and was a member of the Quarter Century Club of the General Electric Company. He was a member of Schenectady City Lodge, Knights Templar, Knights of Pythias, a Shriner, and active in Oriental temple. He was also a member of the First Presbyterian Church. Besides his widow he leaves a son, Arthur Morton; a brother, Edward Morton, both of Schenectady, and three sisters.

WILLIAM CHANDLER PARKS

William Chandler Parks, president of Parks Brothers & Rogers, jewelry manufacturers of Providence, R. I., died on May 7th. Mr. Parks was born in Brooklyn, July 7, 1860, and was educated in public schools of Brooklyn. He started in business with Arnold, Constable & Company, and then entered the jewelry business with Stanley Brothers. In 1891 he formed a co-partnership with his brother, George W. Parks, and Everett I. Rogers, known as Parks Brothers & Rogers, which was incorporated in 1916, when he became president. Mr. Parks leaves a wife, Martha L. Parks; a son, William F. Parks of Los Angeles, and a daughter, Mrs. Norman W. Van Nostrand, of Brooklyn.

W. G. HASKELL

W. G. Haskell, president of the Johnson Gas Appliance Company, Cedar Rapids, Iowa, died on April 17 at his home in that city.

HENRY DERINGER

Henry Deringer died at his home in Brooklyn, N. Y., recently. He was a member of the firm of Spindler & Deringer, Jersey City, N. J., brass founders.

P. H. BERGIN

As we go to press, word comes of the death of P. H. Bergin of A. P. Munning & Company. He was connected with their Detroit office. Full particulars will appear in our July issue.

NEWS OF THE INDUSTRY

Industrial and Financial Events

BEARING METALS MERGER

The National Bearing Metals Corporation will be organized and have its headquarters in New York City. This corporation will be a combination made up of the Bronze Metal Company with the More-Jones Brass and Metals Company of St. Louis and the Keystone Bronze Company of Pittsburgh. The Bronze Metal Company recently acquired the Damascus Bronze Company of Pittsburgh, Southern Brass Company of Portsmouth, Va., and the Brady Brass Company of New York. Alexander Turner, now president of the Bronze Metal Company will be chairman of the board, and J. B. Strauch, president of the More-Jones Brass and Metals Company will be president. The capitalization will be about \$8,000,000.

The main business of this organization will be the production of railway car journals, but of course the company will also make brass, bronze and aluminum products of all sorts.

PREST-O-LITE SELLS BATTERY BUSINESS

The Prest-O-Lite Company, Inc., manufacturers of storage batteries, acetylene gas and gas tanks, announces the sale of its storage battery business to a new company, The Prest-O-Lite Storage Battery Corporation, an Indiana company.

The new company will continue to operate the battery plant at Speedway, Indiana, and because of concentration on batteries it is confidently expected that an increase in volume will result.

F. H. Landwehr, of Toledo, has been elected President of the new company, J. H. McDuffee, of Indianapolis, Vice-President, and J. B. Motley, also of Indianapolis, Secretary and Treasurer. These gentlemen, with F. M. Cobourn and F. A. Harrington, constitute the Board of Directors.

WHITEHEAD SELLS FOR AMERICAN BRASS

The Whitehead Metal Products Company of New York, Inc., announces that arrangements have been made with The American Brass Company whereby they become distributors of brass and copper products sold under the Anaconda Trade-Mark. They will carry adequate warehouse stocks of Brass, Bronze, nickel-silver and copper in the form of sheets, rods, tubes and wire at New York, Brooklyn, N. Y., Jamaica, L. I., N. Y., Boston, Mass., Philadelphia, Pa., Newark, N. J., Buffalo, N. Y.

CANADIAN BRONZE MERGER

The Canadian Bronze Company, Limited, Montreal, Canada, has been organized to acquire all the assets and undertakings of Canadian Bronze, Ltd., St. Thomas Bronze, Ltd., and Northwestern Brass, Ltd. Plants are located at Montreal, St. Thomas, Ontario, Winnipeg and Calgary, Canada. An issue of \$1,250,000 of 7% cumulative sinking fund preference stock has been sold; also 40,000 shares of no par common stock at \$40 per share.

SIMONDS BUYS ABRASIVE COMPANY

Simonds Saw and Steel Company, Fitchburg, Mass., following its recent acquisition of the Abrasive Company, Philadelphia, Pa., manufacturer of grinding wheels and abrasive materials, has arranged for a bond issue of \$1,200,000 to be used in part for the purchase of the new interest as well as for general expansion in the line of abrasive production, a new division of the business.

PHILADELPHIA BRASS COMPANIES MERGE

The Hajoca Corporation, Philadelphia, Pa., has been formed under Delaware laws with capital of \$3,000,000 and 250,000 shares of common stock, no par value, to take over four local companies engaged in the manufacture of plumbing equipment and supplies,

including the Haines, Jones and Cadbury Company, 1136 Ridge Avenue; Keystone Supply and Manufacturing Company, 927 North Ninth Street; the Bridgman Company, 120 South Thirtieth Street, and the Krupp Foundry Company, Stephen Girard Building, with plant at Lansdale, Pa. The first noted company also specializes in the manufacture of brass fittings and soil pipe, and the last in soil pipe and pipe fittings. The new company purposes to continue the different plants as heretofore. A bond issue of \$2,500,000 has been arranged to carry out the merger. J. Harvey Borton, heretofore head of the Haines, Jones and Cadbury Company, will be president of the new corporation.

SAFETY CABLE COMPANY EXPANDS

The Safety Cable Company, 114 Liberty Street, New York, manufacturer of electric wires and cables, etc., has concluded negotiations for the purchase of the plants and businesses of the American Insulated Wire & Cable Company, 954 West Twenty-first Street, and the Brenner-Moxley-Mervis Company, 3427 South Kedzie Avenue, both of Chicago, and will consolidate with its organizations. The first noted purchased company specializes in the manufacture of insulated and bare copper wire, and magnet wire, and the last noted manufactures copper rods, wire, etc. It is understood that the Chicago plants will be continued in service. The Safety Cable Company represents a merger several months ago of the Safety Insulated Wire and Cable Company, New York; the Phillips Wire Company, Pawtucket, R. I., and the A-A Wire Company, Harrison, N. J.

BELKE BUYS CHICAGO HARD RUBBER

William E. Belke, president of the Belke Manufacturing Company, 2932 West Van Buren Street, Chicago, makers of machines for electro-platers, has taken over control of the Chicago Hard Rubber Supply Company, 2948 West Van Buren Street, Chicago, where a large stock of hard rubber material is carried. This company is now prepared to make immediate shipment of high quality hard rubber acid buckets, dippers, pitchers, and funnels in all sizes. This company is also endeavoring to popularize the practice of having firms do their own work in lining wooden and metal tanks with unvulcanized rubber. For this purpose a large stock of unvulcanized rubber and cement is carried.

Pipe and pipe fittings have also been incorporated in the stock of the Chicago Hard Rubber Supply and all sizes of fittings, including tubing, pipes, valves, tees, ells, etc., and such.

DETROIT BRASS COMPANIES MERGE

The General Brass Corporation, Detroit, Mich., has been organized to take over and consolidate the McRae & Roberts Company, 100 South Campbell Street; the Michigan Lubricator Company, 3643 Beaubien Street, and the Standard-Peninsula Brass Works, 6656 Walton Street, all of Detroit.

Officers will be as follows: W. S. Killam, President and General Manager; E. C. Johnston, Vice-President in charge of production; W. S. Chilman, Vice-President in charge of sales; M. E. Czarnowski, Treasurer; P. E. Welton, Secretary.

ANACONDA INCOME FOR 1926

Operations of the Anaconda Copper Mining Company and its subsidiary and affiliated companies were conducted without interruption during 1926 and on about the same scale as during 1925, it is announced in the pamphlet report of the company.

The output of manufactured products of the American Brass Company and Rolling Mills and the production of zinc were larger than in 1925, but the production of copper was smaller. The gross income from sales and tolls amounted to \$223,338,865, as compared with \$212,770,498 in 1925. Operating profit and income from investments amounted to \$29,371,917, as against \$33,077,229 in 1925.

The net profit after all charges, depreciation, bond interest and discount was \$14,226,202, equivalent to \$4.74 a share earned on 3,000,000 outstanding shares of fifty-dollar par stock, as compared with \$17,540,532, or \$5.84 a share, earned in the previous year.

DOEHLER STOCK ISSUE

The Doehler Die Casting Company, Brooklyn, N. Y., has sold an issue of 10,000 shares of \$7 cumulative preference stock of no par value, at a price of \$100 per share, 50% payable on delivery.

Net sales of the company for the year 1926 amounted to \$7,080,207. Net profits after federal income taxes paid, for the three years ended December 31, 1926, average \$429,791 per annum, equivalent to 4.09 times the combined annual dividend requirements of \$105,000 on the preferred stock and the 50% to be initially paid on account of the preference stock. Net profits for 1926 amounted to \$541,528, equivalent to 5.15 times such dividend requirements. After deducting from above average net profits such dividend requirements, the balance is equal to \$2.16 per share on the common stock, and for 1926, to \$2.91 per share.

WESTINGHOUSE REPORTS RECORD YEAR

Sales by the Westinghouse Electric & Manufacturing Company for the year ended March 31, 1927, totalled \$185,500,000 and were the largest in its history, exceeding the previous record figure of last year by twenty million dollars. The net income available for dividends, \$16,138,441, was exceeded only once before during the history of the company. The earnings per share of stock (preferred and common) were \$6.80 or 138 per cent. Both classes of stock are now receiving \$4.00 per share of \$50 par value.

YALE & TOWNE'S QUARTERLY INCOME

The Yale & Towne Manufacturing Company reports for the first quarter of this year an estimated net income of \$532,875 after depreciation and Federal taxes, equivalent to \$1.33 a share earned on 400,000 shares of \$25 par stock. This compares with \$591,332, or \$1.48 a share earned in the first quarter of 1926. Net earnings after expenses were \$713,676, against \$789,660, and the surplus after dividends was \$132,875, against \$191,332.

GENERAL REFRactories GAINS

The General Refractories Company reports a net income of \$455,888 for the first quarter of 1927, after all charges and taxes, equivalent to \$2.04 a share earned on 222,910 shares of no-par stock. This compares with \$299,683, or \$1.33 a share, in the first quarter of 1926.

SAVAGE ARMS LOSES \$99,199

The Savage Arms Corporation's report for the first quarter of 1927 shows a deficit of \$99,199, after depreciation, taxes and other charges, as compared with a net profit of \$69,526, equal after preferred dividends to 75 cents a share for common stock in the first quarter of 1926.

NEW HANDY & HARMAN OFFICIALS

At a meeting of the stockholders of this corporation, held on April 20th, 1927, the following were elected directors: John F. Harman, Parker D. Handy, Harry H. DeLoss, William B. Sewell, Walter H. Bennett, Cortlandt W. Handy, Gustav H. Niemeyer.

Mr. C. W. Handy and Mr. Niemeyer were newly elected.

At the meeting of the newly elected board of directors, held on April 25th, 1927, the following officers were elected: Chairman of the board, Parker D. Handy; vice-chairman of the board, John F. Harman; president, Cortlandt W. Handy; vice-president, Gustav H. Niemeyer; vice-president, George C. Gerrish; secretary, H. W. Spaulding; treasurer, J. L. Brush; assistant treasurer, H. W. Boynton.

C. W. Handy is the newly elected president.

GENERAL CHROMIUM CORPORATION

Simultaneous announcement was made today of the formation of a new corporation by leading companies in the electrochemical industry for the consolidation of important patent rights in chromium plating and of the development of a chromium plating process.

General Chromium Corporation, Union Carbide & Carbon Corporation, through its subsidiaries Electro Metallurgical Company and Union Carbide & Carbon Research Laboratories, Inc., and the Vacuum Can Company, according to F. M. Becket, of the Union Carbide & Carbon Research Laboratories, Inc., have consolidated their patent rights for chromium plating into one corporation known as General Chromium Corporation.

The process identified by the patents is called Duro-Chrome.

Mr. Becket made the following statement regarding Duro-Chrome:

"The development of the art of chromium plating has been for the past several years an interesting problem for electrochemists. The announcement of Duro-Chrome, which is a result of additional knowledge and improved technique, is of great importance to all industries in which the non-corrodible and wear-resisting properties of plated chromium are of definite value."

The General Chromium Corporation with its factory and electrochemical laboratories at Detroit, the affiliated laboratories and plant at Chicago and the affiliated Laboratory at Niagara Falls, will operate as a production plant and will also license and furnish an engineering service for the Duro-Chrome process on a reasonable basis to manufacturers desiring to operate their own plating plants.

On the board of directors of the General Chromium Corporation are Fred J. Fisher of the General Motors Corporation, Benjamin O'Shea of Union Carbide & Carbon Corporation, F. M. Becket, president of Union Carbide & Carbon Research Laboratories, Inc., a subsidiary company of Union Carbide & Carbon Corporation; Burton O. Smith and Roy Gleason of Vacuum Can Company.

The Vacuum Can Company of Chicago has been active in the development of the electro-deposition of chromium for several years. This organization has contributed important operating technique in commercial chromium plating.

M. E. Louth, General Manager of General Chromium Corporation, was for six years General Manager of the Udylite Corporation. Associated either directly or in an advisory capacity are F. M. Becket, Marvin J. Udy, George K. Herzog, Dr. Julius Becker, C. Roy Gleason, Charles H. Eldridge and Victor L. Soderberg.

FARREL VETERANS' MEETING

The annual meeting and banquet of the Veterans Association of Farrel Foundry & Machine Company, Ansonia, Conn., was held in the Masonic Temple at Ansonia the afternoon of May 14th. The Veterans Association consists of employees who have been with the Farrel concern for twenty-five years or more.

The Farrel Foundry & Machine Company is a very old concern, having been established in 1848, more than three quarters of a century ago, by Almon Farrel and his son Franklin Farrel. They first manufactured power drives and gears for installations which, at that time, ran by water power. Gradually they started the manufacture of rolling mills, calenders and other roll operating mechanisms, rubber machinery and sugar milling machinery, until today the Farrel concern serves five basic industries, by the manufacture of metal rolling mills, rubber mill machinery, paper calenders, sugar mill machinery and plastic material machinery, and has expanded from a small plant on the banks of the Naugatuck River to 13½ acres of modern plant space at Ansonia, with a branch plant at Buffalo, N. Y., which has three-quarters of the main plant's capacity.

It is interesting to note that at the time the Farrel Foundry started to build machines with rolls it was necessary to import chilled iron rolls from Great Britain, but this situation was reversed before the death of Franklin Farrel and the Farrel concern was manufacturing and shipping chilled iron rolls to all parts of the world. Today Farrel machinery and Farrel rolls are known all over the world.

The members of the Veterans Association have seen many

changes during the time they have spent with the Farrel Foundry & Machine Company. There are one hundred sixteen members, thirty of whom are on the pension list. The president of the Association, William Bowen, has been in the employ of the Farrel Foundry & Machine Company for fifty-five years, while one other

member has served for over fifty years and several for more than forty years.

Charles F. Bliss, president of the company acted as toastmaster at the banquet and gave a very interesting talk to the members of the Association.

Business Reports of the Metal Industry Correspondents

NEW ENGLAND STATES

WATERBURY, CONN.

JUNE 1, 1927.

Chase Companies, Inc., in an announcement last month, stated: "It is our opinion that the first half of 1927 will be equal to that of 1926. There is little doubt but that the tendency of price is downward. We are operating at about 80 percent capacity. Our stock of goods on hand is about normal. We see nothing in the labor or wage situation as affects our particular industry to be alarming. Real wages are probably as high as they have ever been but individual productivity has kept pace with real wages or perhaps, better, with money wages so that costs per unit are lower, if anything, than a few years ago. There is a very marked conservation as to buying. This is a tendency which has been felt increasingly over the last few years. Smaller and quicker deliveries are quite the thing."

After a checkered career covering a period of 15 years the **Connecticut Brass & Manufacturing Company's** plant on Watertown avenue is to be sold. A public auction will be held on the 7th by order of federal district court. All land, buildings and machinery are included, the land having a frontage of 483 feet. An auction of the company's plant at Mixville was held some months ago but none of the bids received at that time have yet been accepted. William H. Coverdale of Bridgeport is receiver for the concern. The Watertown avenue plant was started in 1912 by John and James Pilling as a growth of their plant founded on Porter St. in 1906. Their growth was rapid and many additions were made. The Pilling brothers sold it in 1918 to a combine of New York and Chicago who intended to do munition work for the government. They also bought the **Connecticut Rolling Mill** of Mixville and combined the two under the present name, forming a \$5,000,000 corporation. It met with much prosperity during the war and at one time operated as many as 20 rolls. After the war, however, it hit a wave of depression and suit after suit was brought by creditors. The United States government also brought suit alleging misuse of the copper sent it for munition purposes. Finally the Equitable Trust Company, representing the bond holders, brought bankruptcy proceedings and a receiver was appointed. The plant continued to operate under the receiver for several years but has been practically dormant for the last year.

The **Bristol Company** of South Waterbury is constructing a \$225,000 office building, consisting of two stories, of brick and steel construction. A one-story auditorium for the use of the employees is also being added, and a brick, steel and wood garage, the latter to cost \$14,000. The company makes a great variety of recording instruments, largely used in the brass industry.

The **Bantam Ball Bearing Company** is to move to this city from Bantam, shortly, its president, **W. S. Rogers** said last month. Atty. W. W. Gager of this city, who has been acting as receiver for the company for the past few months, was elected a director, vice-president and a member of the finance committee at the annual meeting of the company last month. This action followed the discharge of the company from receivership. President Rogers, predicting the company's removal said he thought the money it would spend in taxes, wages and other expenses in this city would be appreciated more here than the people of Bantam and Litchfield have ever appreciated it. The directors elected at the annual meeting last month are: W. S. Rogers, W. W. Gager, Nellie Scott Rogers, J. H. Kraus, Jr., H. H. Edwards, Ray P. Nichols, John L. Buel. They immediately elected the following officers: President and general manager, W. S. Rogers; vice-

president, W. W. Gager; treasurer, Mrs. Nellie Scott Rogers; secretary, Miss H. M. Wichert; H. H. Edwards, assistant general manager and mechanical and sales engineer of the Eastern division, and J. H. Kraus, Jr., Western sales manager.

The assets of the **Morden Manufacturing Company** are to be sold by an order of Judge A. C. Baldwin of the superior court on request of the Waterbury National bank, administrator of the estate of Miss Lulu Morden, who died recently. She was the sole owner of the company which manufactured many small metal articles patented by her.

Incorporation papers have been filed with the secretary of state by the **Oagville Company**, with a capital of \$2,000 consisting of 20 shares. The incorporators are: the **Scoville Manufacturing Company** by L. P. Sperry, secretary, Bennet Bronson, John H. Goss and E. O. Goss. The sole purpose is to retain the name of the Oakville Company for the Scoville Company. The original Oagville Company makers of pins, was headed by Bennet Bronson, now vice president of the Scoville Company and was acquired by the latter concern a few years ago and is now one of its divisions, under the management of Mr. Bronson.

A certificate of incorporation has been filed for the **John Leather, Inc.**, of this city, capital stock, \$50,000. The concern will make articles of metal and other compositions and ornamental dyes. Mr. Leather is also connected with the **Lea Manufacturing Company**, makers of greaseless buffing compounds and buffing wheels.

The city of Waterbury has agreed to pay the **Platt Brothers & Company's** claim of \$23,000 for damages resulting from pollution of the Naugatuck river by sewage. Some years ago the company, which has its plant on the river just below where the city sewage empties, secured an injunction against the city forbidding further pollution. Instead of stopping the pollution the city has every five or six years, paid the company a sum of about this size as damages.

The delegation of Australian manufacturers and employes touring the business centers of this country visited Waterbury last month and inspected the plants of the American Brass Company, Scoville Manufacturing Company, and Chase Companies, Inc., the Waterbury Clock Company and the Waterbury Farrel Foundry & Machine Company, later visiting the Home Progress exposition held here by the Chamber of Commerce.

John A. Coe, president of the American Brass Company was last month re-elected as president of the local Y. M. C. A.

C. F. Schnepp, production manager of the **International Silver Company**, spoke on the mining of copper and zinc, work in which he has had considerable experience, at last month's meeting of the Chase Foremen's association.—W.R.B.

BRIDGEPORT, CONN.

JUNE 1, 1927.

President **Carl F. Dietz** of the **Bridgeport Brass Company** has announced the appointment of **Robert Thurston Kent** as general manager of the company. Mr. Kent is well known as an industrial and technical expert. He is already in Bridgeport and has taken up his new duties. He is a son of the author of Kent's Mechanical Engineers Handbook and is himself the editor and reviser of the latest edition.

Frank D. Fagan of Stratfield road, merchandising expert of the General Electric Company, has been elected vice-president of the **Union Electric Company** by the board of directors at a recent meeting in Pittsburgh. He has been associated

with the General Electric Company for 20 years. In 1920 he became vice president and general manager of the Edison Storage Battery Company.

The **Crane Company**, which already has quite a large plant here, is to bring another section of its country-wide group here, it has been announced. A new building, 60 by 340 feet, to cost \$30,000, is to be erected adjoining its present local plant. In the future the company will do all its pipe bending here.

The **Bassick Manufacturing Company** of this city, now a subdivision of the **Stewart-Warner Company**, is upheld in its patents covering its manufacture of appliances to be used in connection with its Alemite system of lubrication by a decision of the Commissioner of Patents in Washington. Complaints involving half a dozen companies alleged to have infringed on the Alemite plan were filed by the local concern some time ago.

James G. Ludlum, manager of the local branch of the International Silver Company, announces that the coal purchase plan of the company for employees will be revived again this year. This allows them to purchase coal on the installment plan and yet have the advantage of cash prices. The company last year advanced its employees \$78,254 through the plan.

Reference was made last month to the action brought against the **Monumental Bronze Company** by certain of the stockholders. The company wishes to correct the impression that the action was brought by a majority of the stockholders or that it involved bankruptcy proceedings. The action, ac-

cording to **Ralph M. Sperry**, vice president of the company, was brought by a small minority stockholder for equity proceedings to try to force the company to distribute a surplus of \$90,000 which it carries on its books. The company does not owe a cent of bank or other loans and merchandise bills have been discounted for 50 years, Mr. Sperry states—W.R.B.

CONNECTICUT NOTES

JUNE 1, 1927.

STAMFORD.—**Yale & Towne Manufacturing Company** reports for the quarter ending March 31, 1927, net earnings after depreciation and taxes of \$532,875, equal to \$1.33 per share on the 400,000 shares (\$25 par) as compared with \$1.47 per share for the March quarter, 1926. The surplus figure for the quarter this year is \$369,442 compared to \$191,332 for the same quarter last year.

CHESTER.—The **Cheshire Foundry Company**, formerly the Alchrome Bearing & Casting Company, is preparing to reopen its factory again, according to an announcement by its owners. The old factory was burned about a year ago but has been replaced by a new factory, just completed.

NAUGATUCK.—The **Risdon Manufacturing Company**, makers of metal novelties, has purchased seven and one-half acres of land from the W. B. Lewis estate on Arch St., a short distance from the concern's main plant. The company now owns most of the land between its plant and that of the United States Rubber Company.—W.R.B.

MIDDLE ATLANTIC STATES

NEWARK, N. J.

JUNE 1, 1927.

The plant of the **Balbach Smelting and Refining Company** on the Newark Bay Shore has been leased by the **American Metal Company, Ltd.**, and is now being operated by a subsidiary of that concern. The lease is for five years and contains a purchase option clause. The **United States Metals Refining Company** of Chrome, N. J. is the American Metal subsidiary that will control the operation of the Balbach plant. It is expected that some executives of the latter will retire, but that the organization as a whole, numbering upward of 400, will be retained.

Extraction and refining of lead will be made the specialty at Balbach, which heretofore also has handled copper. The latter metal will be handled exclusively at the Chrome plant. American Metal is the owner of large lead properties in various countries, but up to the present, has had no refinery in this country. The lease of the Balbach plant is to give it these facilities. Its ore in ships may be brought directly to the Balbach docks from all quarters of the globe. The move is expected to make the American a larger factor in the lead industry in this country, particularly in the scrap lead market. The Balbach plant has an estimated capacity of 6,000 tons a month.

The Balbach business was found in Newark in 1851 by Edward Balbach soon after his arrival from Germany and has been one of the city's leading industries since. Edward Balbach, Jr., soon joined his father in the business and was credited with having invented and devised many improvements in smelting and refining. A. R. Watson, a New York lawyer, is president of the Balbach Company. The Balbach Smelting and Refining Company and a kindred corporation, the Balbach Metals Company, will continue in existence. They will manage mining properties owned by them.

The **American Metal Company, Ltd.**, is a holding company owning or controlling a number of subsidiaries engaged in the production, refining and distribution of electrolytic copper, zinc, lead, silver and other metals; coal mining and the production of sulphuric acid. It has been a shareholder of the Balbach Companies for some time.

The **R. Neumann Hardware Company**'s plant, comprising several buildings, has been purchased by the **Rauchbach-Goldschmidt Company**, makers of trunk products. The property contains 140,000 square feet of floor space. The Neumann firm

is a subsidiary of the **Bassett Metal Goods Company** and will move to the home of its parent concern at Derby, Conn.

Vice Chancellor Backes has appointed Judge Frank A. Boettner receiver for the **Hercules Novelty Manufacturing Company, Inc.**, toy makers, of 126 South Street. Application for a receiver was made by the **Ironbound Tool and Machine Company**. It is charged that the concern has suffered heavy losses. Assets are said to be \$10,000 and liabilities \$40,000.

Vice Chancellor Church has appointed James H. Phillips receiver for the **Pennant Radio Laboratories, Inc.**, radio parts manufacturers. Application for a receiver was made by Jacob H. Zeitlin, secretary and treasurer of the company. It is said that the concern has not cash to meet its payroll. The company was incorporated two years ago.

The **Art Metal Works, Inc.**, has circularized the trade, denying that its radiator ornaments infringe in any manner certain United States letters patent. The company promises to protect its dealers in the event of litigation.—C. A. L.

TRENTON, N. J.

JUNE 1, 1927.

Business at the plants of the metal manufacturing concerns does not show any improvement over last month and few of the manufacturers feel encouraged about the outlook. **Fred A. Barton**, president of the **Trenton Emblem Company**, says that according to present conditions the summer season is not going to be a very good one. The metal departments of the **John A. Roebling's Sons Company** are not running to capacity, while some of the smaller plants also complain of business being dull.

The plant of **Aurele M. Gatti, Inc.**, manufacturers of watch jewels and fountain pen points, 1701 Liberty Street, which was gutted by flames some time ago has been rebuilt. The company suffered a heavy loss through the blaze, but is now running to capacity again.

The following concerns have been incorporated here: **Roche Corporation**, smelting metals, Jersey City, 2,500 shares; **Imperial Jewel Company**, manufacture jewelry, Camden, \$100,000; **Lite-Ray Cooker Corporation**, manufacture cooking apparatus, Plainfield, \$200,000; **Erickson Electric Service, Inc.**, electrical appliances, Montclair, \$125,000; **Hill City Battery and Ignition Service, Inc.**, manufacture supplies, Summit, 500 shares; **Murray & Adler, Inc.**, plumbing supplies, Hackensack, \$100,000.—C. A. L.

MIDDLE WESTERN STATES

DETROIT, MICH.

JUNE 1, 1927.

According to an announcement recently made by **Milton A. McRae** the **McRae & Roberts Company**, brass goods manufacturers, the **Michigan Lubricator Company** and the **Standard-Peninsular Brass Works**, all of Detroit are to be merged as the **General Brass Corporation**.

The new organization will have as its president **W. S. Killam**, now president of the McRae & Roberts Company. **Elwood C. Johnston**, now vice-president of the Michigan Lubricator Company will be first vice-president and **William S. Chilman**, now vice-president of the **McRae & Roberts Company** will be second vice-president. **Milton E. Czarnowski**, now secretary-treasurer of the McRae & Roberts Company will be treasurer and **Philip E. Welton**, of the Standard-Peninsular Brass Works, secretary. The board of directors will consist of Milton A. McRae, John B. Corliss, Frederic G. Austin, W. S. Killam, Carlton M. Higbie, Elwood C. Johnston and William S. Chilman. Manufacturing operations, it is stated, will be centralized in the large modern plant of the McRae & Roberts Company, Campbell avenue and the Wabash railroad. Their combined output will include gas stove cocks, radiator valves, plumbing goods, automobile parts and a comprehensive line of brass and metal goods, all of which they have been manufacturing for years, and the distribution of the combined companies will extend into nearly every state in the union. Plans are under way, it is stated, looking to the necessary expansion of the plant to accommodate the increased volume of production, and additional machinery and foundry equipment will soon be installed.

It is expected the new factory building of the **Peninsular Stove Company**, which was recently started on the Burt Road, at the Pere Marquette railroad will be ready for occupancy sometime in October and the office building in December. The new plant will be divided into a two-story administration building and a factory building 256 feet by 800 feet. The total cost has not been announced. A 50 per cent increase in production is anticipated with the new factor's completion. The Peninsular Stove Company is the second largest producer of stoves in the country, and since 1892 has occupied a plant at West Fort street and Trumbull avenue. While this site has been sold for approximately \$2,500,000, a building on the north side of Fort street will be retained as a downtown branch.

The name of the **Mueller Brass Company**, at Port Huron, Mich., has been changed to the **Lapeer Avenue Corporation**.

General Welding, Inc., is the name of a new concern to be incorporated at Fordson, Mich. The owners are Clinton B. Irwin, John Kalkalon and Abram Barnett, 924 Hague avenue, Detroit.—F. J. H.

TOLEDO, OHIO

JUNE 1, 1927.

The general conditions in the brass, copper, aluminum and plating industry in Toledo have been favorable for a number of months and the outlook for a considerable time, declare those interested in these lines, is promising.

No one seems able to point definitely to the reasons why these favorable conditions should exist when other manufacturing centers do not seem to be so favored. The employment situation is good. But few reliable workmen in any of the lines mentioned are out of employment. Practically every plant in the city is operating.

Information from the Chamber of Commerce states that one reason why Toledo is so favored is because it has such varied industries. The business stability is not dependent on any particular line. Many in these varied lines for instance maintain plating plants. This of course keeps the plating industry active practically all the time. This is the situation at the present time and has been for many months.

Platers just now are interested in the coming convention of their national organization which will be held in Toledo the last days of June and the first of July.—F. J. H.

CHICAGO, ILL.

JUNE 1, 1927.

The **Capital Aluminum & Brass Foundry Company**, 2454 Fullerton Ave., has been incorporated. The firm will manufacture metal castings. Incorporators are Walter Hunter, Frank Kerbe, and Fred Hoack.

The **Sueske Brass and Copper Company** have announced that its capital stock has been increased from \$50,000 to \$150,000.

The **Central States Metal Works** has been incorporated at Chicago for \$7,000. The firm will manufacture and market metal specialties. Incorporators are David Woodbow, Elmer Thalin, Oscar H. Breyfegle and Roy H. Maybey.—A. P. N.

MILWAUKEE, WIS.

JUNE 1, 1927.

Brass manufacturers in this district report a very good month during April and the first three weeks in May. Business has assumed a very steady tone and the increase in building in this territory this spring has created an extra demand for brass products.

Such Milwaukee firms as the **Roberts Brass Company**, the **Milwaukee Brass Company**, the **Monarch Brass Company**, the **Perlick Brass Company**, **Kagel Brothers Brass Company**, the **Standard Brass Company** and the **Superior Brass Company**, all report a good number of orders on hand to keep the plants running on a sizable schedule and all seem to think that business will continue good throughout the summer.

An event of interest to the metal industry in Milwaukee this month was the sectional meeting of the **American Society for Steel Treating** which was held May 18 to 20 at the Hotel Pfister. Delegates from all parts of the country attended and it was called one of the "banner" meetings of the society.

One of the most prominent speakers there was Dr. Zay Jeffries, **Cleveland**, consulting metallurgist of the **Aluminum Company of America** who spoke of the changing trends in airplane construction due to the development of aluminum alloys.

"Europe is far ahead of us in the use of aluminum alloys for airplane construction," he said. "The trend is distinctly toward metal planes. Without light metal alloys, the airplane would not get past the bamboo-silk stage. Heat treated aluminum alloys are now used for nearly everything in airplane structure—wing and body covering, struts, tail skids, crank cases and propellers. The alloy is 30 per cent lighter than wood for the same strength. Aluminum pistons expand, when the motor is heated, 80 per cent more than iron or steel, but piston rings solve this difficulty."

"Another field in which aluminum alloys are just beginning to be used is in making railway passenger cars. The Northwestern and Illinois lines are using aluminum for car bodies. They find it will reduce weight and will last longer. Aluminum almost immediately upon being exposed to air, forms an oxidized film that prevents further corrosion. This greatly increases the length of life of railway cars."

"Another use of aluminum alloys is in Milwaukee's outboard motor industry."

"The tempering of aluminum gives it a tensile strength of 55,000 pounds per square inch and allows elongation of 15 per cent. This is about the same as mild (low carbon) steel with one third the weight."

The **Wisconsin Guard & Shield Company**, Menasha, Wis., which was just recently incorporated at \$200,000 has announced that it will move its plant and equipment to Waupaca, Wis. With the present firm is merged the **Acme Brass Works** and the **Jorgenson Farmer Plant** of Waupaca and the **Tayco Register Shield Company** of Menasha. The officers of the firm are: J. M. Braun, president; Chris Pommer, secretary and treasurer; C. M. Crawford, general manager.

The firm will begin operating June 1 it is reported and will continue to manufacture radiator shields and register shields as well as many other products. The plant will be operated by

waterpower and will generate its own electric current. George H. Allen, formerly general manager of the Kenosha Branch of the American Brass Company, but for the past five years in charge of the plant at Buffalo, has resigned his position as vice president of the company according to a recent announcement which reached Kenosha. Announcement was also made that J. A. Doucet who has been assistant manager of the Kenosha branch of the American Brass Company has resigned his position to become associated with the Michigan Brass and Copper Company in the capacity of sales manager. Mr. Allen will become the vice president and general manager of the Michigan Brass and Copper Company.

Nathan & Barney Silver of the Silver Metal Company,

Racine, Wis. have announced that they have purchased a two story frame building in Racine to enlarge their quarters.

The Advanced Beveling & Silvering Company, Milwaukee has changed its name to the Advanced Mirror, Brass and Art Glass Works Inc., according to a recent announcement by the owners.

The American Metal Company, has been incorporated at Green Bay, Wis., for \$8,000 by Gregory Engebos, John Sinclair and Francis Evrad.

Morris Block, president of the Wisconsin Iron & Metal Co., Oshkosh, Wis., whose plant was burned to the ground last month has announced that he will rebuild, work to be begun immediately.—A. P. N.

OTHER COUNTRIES

BIRMINGHAM, ENGLAND

MAY 16, 1927.

Though a slight improvement is noticeable in the metal trades of the district the expansion is not so great as might have been expected when the year opened. In the brass trade a falling off in orders is attributed in part to the new phase upon which house building enterprise appears to have entered after the intense activity of the past few years. Some unsteadiness is noticeable in those departments making domestic fittings while cabinet brass foundry also is in slower demand. Orders for copper pipes and fittings are coming in more briskly than for some time past and some encouragement is derived from the fact that the expanding requirements of ship-builders have given a fillip to this branch. While the demand for rolled and other brass has declined the inflow of business from overseas shows an improving tendency. Indian trade has not been so good as last year and shipments to the East have naturally been interfered with by the Chinese disturbances. Exports of brass sheets and strip during the first quarter totalled 1,805 tons as compared with 3,524 tons in the corresponding period of last year, while other brass and alloys of copper totalled 2,778 tons as compared with 2,837 tons.

A number of orders have lately been given out by the Government to firms in Birmingham and district and a large num-

ber of well-known manufacturers in the brass and metal trades have benefited. These contracts are not connected with special shipbuilding orders (of which some are pending) but are merely for the renewal of stores. The heaviest individual items are under the head of sheets, bars, etc., the orders for which have been divided between the Birmingham Battery & Metal Company, Ltd., James Booth & Company, Ltd., Charles Colford & Son, Ltd., P. H. Muntz & Company, Ltd., West Bromwich, H. Vivian & Company, Ltd., and J. Wilkes, Son & Mapplebeck Ltd. An order for duralumin has been placed with James Booth & Company, Ltd., while a number of useful orders from the Admiralty, Post Office, War Office and Air Ministry cover a variety of products.

The electroplate and cutlery trades of Sheffield remain very depressed on the whole but occasionally increased bookings are heard of and trade with South America is said to be improving. The exports of cutlery compare unfavorably with the corresponding period of last year, while on the other hand imports over the first quarter show an increase of nearly £35,000.

The steady growth of the motor industry in Britain is providing a good deal of work in aluminum castings which are now being used to a great extent in motor car engines. Business continues at a steady pace in the industry and although there is some unemployment other firms are working at high pressure.—J. H.

Business Items—Verified

A. Harris and Company, 212 North Curtis Street, Chicago, Ill., will build a brass foundry, 25 x 133 ft., to cost \$8,500.

Belden Manufacturing Company, Richmond, Ind., manufacturers of insulated copper wire awarded contract for construction of a plant. Estimated cost \$205,000.

Armstrong Cork and Insulation Company's New York office is now located at 225 Broadway; and their Tulsa, Okla., office is at 419 Central National Bank Building.

The **A. W. Reiser Manufacturing Company**, 119 Ontario Street, Toledo, Ohio, manufacturer of electric lighting fixtures, etc., has repaired the portion of its plant destroyed by fire, and is again in full operation.

The **Chicago Smelting and Refining Company**, 2457 South Loomis Street, Chicago, Ill., has let contract for a three-story addition, to cost close to \$90,000 with equipment. H. Feinberg is president and treasurer.

Glenwood Range Company, Taunton, Mass., recently placed contract with the Ferro Enamel Supply Company, of Cleveland, for a complete porcelain enameling furnace, equipped with the recuperator and charging forks.

The **Servel Corporation**, manufacturers of iceless refrigerators, have placed a contract with the Ferro Enamel Supply Company, Cleveland, O., for two complete porcelain enameling furnaces to be erected in their plant at Evansville, Ind.

The **Hills-McCanna Company**, Chicago, Ill., will erect two buildings, 60 x 200 ft. for a metal foundry, at a cost of \$150,000. This firm operates the following departments: brass, bronze foundry, brass machine shop, tool room, casting shop.

The **Ferro Enamel Supply Company**, of Cleveland, Ohio,

has taken larger space in the B. F. Keith Bldg., to take care of the recent enlargement of its Engineering Department. This company is also making a large addition to its enamel making plant.

The **Aetna Porcelain Enamel Company**, 4701 Augusta Street, Chicago, operating a metal enameling plant has awarded a general contract for a three-story addition to be used for storage of raw materials and mixing and melting enamels, to cost about \$17,000.

The **C. P. Henry Novelty Company**, Providence, R. I., manufacturer of adjustable curtain rods, will open a branch factory at North Chicago, Ill., where it has acquired 4,000 sq. ft. of floor space in a building at the corner of Commonwealth Avenue near Twenty-second Street.

The **Federal Electric Company**, 8700 South State Street, Chicago, announces a complete line of Federal electric ranges. Six models are now being manufactured. They will be on exhibit at the National Electric Light Association Convention, Atlantic City June, 4-10, booths 171-172.

The **Bridgeport Metal Goods Company**, Cherry Street, Bridgeport, Conn., is having plans prepared for the construction of a two-story, 60 x 240 ft. plant. Estimated cost \$100,000. This firm operates the following departments: tool room, cutting-up shop, plating, stamping, polishing, lacquering.

The **Rome Wire Company**, Rome, N. Y., will soon begin the superstructure for their proposed mill addition on Amherst Street, Buffalo, N. Y., to be one story, 120 x 300 ft. and to cost in excess of \$100,000 with equipment. This firm operates the following departments: rolling mill, tinning.

The **E. Poeter Company**, 1168 South Grove Street, Irvington, N. J., manufacturer of bag frames, etc., has plans for a two-story addition, 65 x 100 ft. to cost \$50,000 with equipment. This firm operates the following departments: tool room, plating, stamping, soldering, polishing, lacquering, grinding room.

Segal Lock and Hardware Company, 155 Leonard Street, New York, has let the general contract for a bronze foundry addition. This firm operates the following departments: brass, bronze foundry, brass machine shop, tool room, spinning, plating, japanning, stamping, soldering, polishing, lacquering, grinding room.

The **Wayne Company**, Fort Wayne, Ind., manufacturer of gasoline pumping equipment, etc., has erected and is now occupying a one-story top addition, which cost about \$25,000. This firm operates the following departments: tool room, brazing, plating, japanning, stamping, soldering, polishing, lacquering, grinding room.

The **Big Three Welding & Equipment Company** of Fort Worth and Houston, Texas, who are the Texas and Oklahoma distributor for "Stable-Arc" Welders, manufactured by The Lincoln Electric Company, Cleveland, Ohio, announce the opening of their third warehouse branch at No. 1 North Frankfort St., Tulsa, Oklahoma.

Consolidated Products Company, 15 Park Row, New York, has purchased the glycerine refining plant of Marx and Rawolle of Brooklyn, which is in the process of liquidation. The machinery is being dismantled and the real estate offered for sale or rent as a warehouse. Over 1,000,000 pounds of copper were gathered from this plant as the equipment was of particularly high grade to insure the purity of the product.

The **Lincoln Electric Company** of Cleveland, Ohio, announces the appointment of the Wade Engineering Company, 1855 Industrial Street, Los Angeles, California, as distributor of Lincoln products in California. This Company maintains a branch at 69 Webster Street, Oakland, California, both main office and branch carrying stock of Lincoln welders, as well as service parts. The Los Angeles branch is in charge of Henry N. Wade, who is also President of the Company. The Oakland branch is under the direction of H. T. Lintott.

The **Annapolis Lead Company**, of Annapolis, Mo., has adopted a cooperative group insurance program providing triple protection for its employes by means of life insurance, health and non-occupational accident benefits and accidental death and dismemberment coverage. The life insurance alone in force exceeds \$200,000, while about the same figure applies in the case of the accidental death and dismemberment insurance. One of the interesting features of the group plan, which the Metropolitan Life Insurance Company is underwriting, is the cooperative arrangement under which the employer and insured employes share the cost.

Grand Haven Brass Foundry, Grand Haven, Mich., A. E. Jacobson and Paul A. Johnson, owners, bought out two metal working plants, one in that city and the other in New Jersey. Cochran Brothers Brass Foundry of Washington, N. J., was the eastern concern purchased by these two men for the manufacture of plumbers' brass goods and will be changed in name from the present one to the Eastern Division of the Grand Haven Brass Foundry. The other factory acquired is the Bolling Manufacturing Company of this city. This firm operates the following departments: brass, bronze foundry, brass machine shop, tool room, casting shop, plating, stamping, polishing, lacquering, grinding room.

INCORPORATIONS

Stege-Jenkins Brass and Plating Works, 520 W. Chestnut Street, Louisville, Ky., have been incorporated for \$8,000, by Louis C. Stege, H. C. Jenkins and G. C. Jenkins. This firm will operate the following departments: brass machine shop, plating, polishing, lacquering.

The **Weaver Brothers Company** was recently incorporated at Clinton, Mich., for the manufacture of metal cleaners, pickling baskets, and complete pickle room supplies for the general trade. J. C. Weaver is in charge of the plant. R. A. Weaver is president of the company, and H. E. Ebright and H. L. Brooks are vice-presidents.

The **General Metals Company, Inc.**, 17th and Arch Streets, Philadelphia, Pa., has been organized to manufacture a metal compound for use in filling blow holes and other imperfections in cast iron, steel, brass and bronze, and also a hard aluminum brazing compound. Manufacturing will be done under contract and no materials or equipment will be purchased. Carl E. Korte is president.

Spencer Brothers, Inc., Dundee, N. Y., have been organized to manufacture patented specialties, and will be in the market for malleable iron castings, spring steel of $\frac{1}{4}$ " to $\frac{3}{8}$ ", copper and iron rivets, stove bolts, $\frac{1}{8}$ " hard drawn copper, light chain and other products. C. Judson Spencer is president. This firm operates the following departments: cutting-up shop, japanning, soldering, polishing, grinding room.

The **Smithlite Castings Corporation**, Buffalo, recently formed with capital of \$250,000 by William W. Smith, 940 Michigan Avenue, Buffalo, and associates, is planning the operation of a local plant for the production of magnesium and aluminum alloys. Fred Henn is president; W. W. Smith, mechanical engineer; J. J. McCarthy, vice-president; H. J. Flumerfeldt, secretary, and George Welte, treasurer.

The **Flood City Brass and Electric Company**, Messenger and Elder Streets, Johnstown, Pa., has been formed to take over the business of the Flood City Manufacturing Company, and will manufacture brass, bronze and aluminum castings, chiefly for the mining trade. C. N. Replogle is president and general manager. This firm operates the following departments: brass, bronze and aluminum foundry; brass machine shop.

The **Midwest Die Casting Company**, Milwaukee, Wis., has been incorporated with an initial capitalization of \$10,000 to manufacture die castings, tools, dies, jigs, fixtures, etc. The identity of the principals and definite plans for plant and production are withheld for the present. The interests are represented by Adolph Zingen and associates, 616 Michigan Street, Milwaukee. This firm will operate the following departments: tool room, casting shop.

The **Fellows Brass and Iron Foundry**, Waterville, Maine, has been organized to conduct a general foundry and machine shop business with capital stock of \$10,000, all of which is common stock; \$10,000 paid in; par value of a share, \$100; number of shares subscribed, 100; directors Frank C. Fellows, president; L. S. Smith, treasurer, C. A. Blackington, clerk. This firm will operate the following departments: brass, bronze and aluminum foundry; brazing, grinding room.

Lambert Art Metal, Inc., McKinley and Lorain Avenues, Columbus, Ohio, has been organized as a successor to the Lambert Metal Door Company and will extend its lines of manufacture. They also expect to develop a new and patented burial case of non-ferrous metals. Some new machinery will be purchased. The company is particularly interested in the manufacture of die castings either by contract or the installation of its own equipment. This firm will operate the following departments: rolling mill (cold rolled shapes); stamping, tinning, soldering, polishing, lacquering, grinding room.

METAL STOCK MARKET QUOTATIONS

	Par	Bid	Asked
Aluminum Company of America.....	..	67	69
American Hardware Corporation.....	\$100	83	85
Anaconda Copper	50	45½	46
Bristol Brass	25	8	10
International Nickel, com.	25	71	72
International Nickel, pfd.	100	107	110
International Silver, com.	100	165	166
International Silver, pfd.	100	116½	...
National Enameling & Stamping.....	100	30	32
National Enameling & Stamping, pfd....	100	69½	70
National Lead Company, com.	100	195	196
National Lead Company, pfd.	100	131	132
New Jersey Zinc	100	179	181
Rome Brass & Copper.....	100	132	142
Scovill Manufacturing Company.....	..	58	60
Yale & Towne Mfg. Company.....	..	73	75

Corrected by J. K. Rice, Jr., Co., 120 Broadway, New York.

Review of the Wrought Metal Business

Written for The Metal Industry by J. J. WHITEHEAD, President of the Whitehead Metal Products Company of New York, Inc.

JUNE 1, 1927.

A decline in the price of fabricated brass and copper materials in the form of sheets, rods, tubes and wire, which took place in the latter part of May, brought the published prices for these commodities down to a level within less than $\frac{1}{2}$ c per pound of the low level which was established on the 11th of February. The continued weakness in the price of ingot copper has again made buyers shy, with the result that orders are being placed only for absolute needs and day-to-day requirements. As is usual in a situation of this kind the reaction has been felt by the mills with a noticeable falling off in orders, although as the month closed and buyers were reluctantly forced into the market, it was observed that a better feeling was beginning to prevail, and tonnage in increasing quantities was being offered. Most buyers feel that any purchases made, based on copper below 12 $\frac{1}{4}$ c cannot be very far wrong, and the chances of taking a loss on any material bought below that level are very slight.

There was some slight falling off in general business activity noted, and in some lines, particularly plumbing, which has been affected by the strike, the consumption of brass pipe has been smaller than it otherwise might have been. This has had its effect also upon the general building trade, and while there is a reasonably fair amount of business being placed, for construction work, the volume cannot be said to approach anything near that which was the rule at this time a year ago. It is expected that with the settlement of the difficulties in the building trade, which has recently been reported, there will be a general resumption of activity all along the line.

While most of the mills report that they are running some-

what behind last year's first four or five months in production, it cannot be said that there is any serious dullness noted, but on the contrary the feeling is one really of a willingness to complain about poor business without being able to sustain such a complaint by the actual facts. All hands seem to be running along on a reasonably good basis.

Pure nickel and the nickel and copper alloys, such as Monel metal, nickel silver, and similar metals have been moving on a very satisfactory basis. May was one of the largest months in history for the producers of Monel metal and pure nickel, and the order books are in such shape it is expected that June and July will continue on a record-breaking level. In a month which has otherwise been lacking in any outstanding item of interest in the non-ferrous metal trade, these two items are occupying a pre-eminent position.

The number of new applications which have been made in various industries for both Monel metal and nickel, have been increasing so rapidly that the influx of new business and the prospects for future enormous consumption has encouraged the producers to open a new mine with the view of being able to supply this demand which they feel is well on the way to reach a tremendous volume within the next few years.

Throughout the trade the general business conditions are being watched with a great deal of interest, and it is felt that during the next few months the outlook for the balance of the year will be very plainly indicated. In most quarters it is felt that there is justification for being optimistic as to this outlook, but the more conservative view is held that about all that can be expected will be a continuance of business on the level at which it is now being done.

Metal Market Review

Written for The Metal Industry by R. J. HOUSTON of D. Houston & Company, Metal Brokers, New York

COPPER

The outstanding event last month was the distinct weakness of the market. Active trading was confined to moderate dimensions, while much of the time general demand was sluggish with frequent price declines during the last half of the month. Considering that opening quotations in May were at the low level of 13 cents, eastern delivery, the subsequent depression was regarded as a discouraging development. The relation between supply and demand has not been adjusted to maintain a strong market position. The greatly increased consumption of copper has been met by a greater growth in output, and the price trend has consequently been downward.

During the last few days of May the market became conspicuously weak, and sales were made as low as 12 $\frac{1}{2}$ cents. This marked the turning point, however, and active buying lifted the price to 12 $\frac{1}{4}$ cents delivered in Connecticut Valley. More interest was displayed at the close, with firm tone at 12 $\frac{1}{4}$ c @12 $\frac{1}{4}$ c for eastern delivery.

ZINC

Zinc, like some other metals, is suffering from overproduction, and the situation is consequently depressed with prices at the low ebb of 6 cents East St. Louis. Stocks in smelters' hands were increased in April to the extent of 4,929 tons, the amount on hand May 1 being 41,208 tons. A further increase in stocks occurred during the first half of May making the total quantity of excess stocks amount to 45,407 tons. These figures contrast with 21,887 tons on January 1, an increase of 23,520 tons during the first four and a half months of this year. The market prices for zinc ores dropped to \$38 per ton.

TIN

A reduction of 1,592 tons in the total visible supply of tin during April created a sharp rally in the market early in May. Subsequent strength lifted the price of spot Straits

to 68 $\frac{1}{2}$ cents. This figure compared with 66 $\frac{1}{2}$ cents a short time before, the scarcity of prompt supplies causing a decided advance. The May position held firm for a time, but later deliveries showed a wide spread in quotations. There was active trading on a more or less extensive scale, but consumers followed a general policy of caution. The market fluctuated back and forth in typical fashion according as the many cross currents affected sentiment.

The month closed firm, with June delivery of Straits tin quoting 66 $\frac{1}{2}$ @66 $\frac{1}{4}$ c.

LEAD

A declining market both at home and abroad continued throughout, most of the past month. There were four reductions in price during May, and the present level of 6.40c New York and 6c St. Louis basis compares with 6.85c New York at the end of April. The present quotation is the lowest since July 1923, and more than a full cent a pound below the low price in 1926. There was a fair volume of consuming buying from time to time as the market turned in buyers favor, but despite the low prices demand was not active enough to change the uncertain tone of the market. An adverse feature is the lightness of demand from battery makers.

ALUMINUM

The rate of consumption continues good, and prices are maintained at 25 $\frac{1}{2}$ c @26c for Virgin ingot 99% plus and 25c for Metallurgical 94-99% grade. There is an ample supply of the metal to meet all requirements, and a substantial surplus of secondary grades which had tended to keep the market for scrap material easy. Imports of aluminum during the first quarter of this year show a decrease of close to 4,000,000 pounds as compared with those during the last quarter of 1926. Importers are carrying good sized stocks in U. S.

bonded warehouses, and it seems to be the policy to keep imports down until present holdings are reduced. The greatly increased production of aluminum in recent years is a notable feature in the metal industry, and further new high records will undoubtedly be established.

ANTIMONY

Conditions in antimony were in buyer's favor during the first half of May, with consuming demand quiet, although some fair sized sales were made for prompt and future deliveries. Futures were offered at 11 cents c.i.f. New York, but easier conditions developed and business was done at 12½c duty paid. A firmer tone prevailed during the last half of May, but more recent tendency was easier. Chinese holders were quoting higher figures than domestic sellers, but the local offerings were sufficient to meet the limited demand.

Market was dull and easy at close of month, with prompt delivery quoting 12¾c@12½c duty paid.

QUICKSILVER

The situation in quicksilver has been irregular lately, with holders more anxious to realize on stocks in hand. Quotations at London and locally are lower, and domestic interests quote \$124.00 per flask. It is claimed that basic conditions show little change, and consumption in this country is reported heavy. Stocks in United States bonded warehouses at the close of March amounted to 153,791 pounds. Recent imports were in good volume. It is possible that lower prices than above quoted might be accepted.

SILVER

There was a tendency for the price of silver to strengthen slightly during the past month, but the fall gain in the advance was not maintained. The military situation in the Far East caused an increased demand for account of Chinese speculators who were heavy buyers recently. In the last half of May silver sold at 57 cents, which is only 3 cents below the high reached on the market apart, last February. During the price collapse of the white metal last October value slumped to 51½ cents an ounce. Heavy shipments of silver

have been going to India during the last six weeks. London and New York furnished most of the supplies taken for Indian account. Silver stocks at Shanghai on April 30 amounted to 137,693,000 ounces, against 123,948,000 ounces on January 4, 1927. Indian reserves on April 30 were equivalent to 358,841,000 ounces, as compared with 355,644,000 ounces on January 4, 1927. United States production of silver for first four months of 1927 was 19,589,000 ounces, a monthly average of 4,897,250 ounces, compared with a monthly average of 5,077,000 ounces in 1926. As this report is closed the domestic price is 57 cents per ounce.

PLATINUM

Values in platinum reveal a weak situation in this article, and there is no indication of an early improvement. Prices of refined platinum quote \$67 to \$69 an ounce, and compares with an average price for 1925 and 1926 of \$111 per ounce. Large sales have been reported for account of Russian producers at a time when stocks were ample. Russia is supplying at the present time more than half of the world's requirements. Cost of production in that country is said to be about \$40 to \$45 per oz., so it could not be surprising if the market price reached a lower level. Present levels are the lowest in over five years.

OLD METALS

Concessions in scrap metals are necessary owing to the downward drift in market for the new metals. Weakness featured several of the secondary grades lately, and owing to uncertainty over the outlook buyers were less inclined to trade on a large scale. The export demand is not so urgent as it was, but there is still an outlet for foreign shipment at lower prices than formerly. Consumers and dealers display caution, but in some quarters there is a feeling that prices for certain grades may be near bottom. Large supplies of aluminum scrap were reported in the Detroit district. Dealers were willing to buy recently on the basis of 10½c @10¾c for heavy copper, 9c @9¼c for light copper, 6½c @6¾c for heavy brass, 8¾c @9c for new brass clippings, 5½c @5¾c for heavy lead, 3¾c @4c for old zinc, and 18½c @19c for aluminum clippings.

Daily Metal Prices for the Month of May, 1927

Record of Daily, Highest, Lowest and Average Prices and the Customs Duties

	2	3	4	5	6	9	10	11	12	13	16	17
	14	15	16	17	18	19	20	21	22	23	24	25
Copper (f. o. b. Ref) c/lb. Duty Free												
Lake (Delivered)	13.125	13.125	13.125	13.125	13.125	13.125	13.125	13.125	13.125	13.125	13.125	13.125
Electrolytic	12.875	12.875	12.875	12.875	12.875	12.875	12.875	12.875	12.875	12.875	12.875	12.875
Casting	12.80	12.80	12.80	12.80	12.80	12.80	12.80	12.80	12.80	12.80	12.80	12.80
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb.												
Prime Western	6.125	6.125	6.15	6.15	6.15	6.15	6.15	6.15	6.15	6.10	6.075	6.075
Brass Special	6.175	6.175	6.20	6.20	6.20	6.20	6.20	6.20	6.175	6.15	6.15	6.125
Tin (f. o. b. N. Y.) c/lb. Duty Free												
Straits	67.00	66.75	67.375	68.50	68.125	68.50	68.00	68.00	67.50	67.375	66.625	67.00
Pig 99%	64.75	64.25	64.50	65.00	64.625	64.625	64.375	64.125	63.625	63.125	62.875	63.00
Lead (f. o. b. St. L.) c/lb. Duty 2¼c/lb.												
6.45	6.45	6.40	6.40	6.40	6.40	6.40	6.40	6.40	6.40	6.40	6.375	6.30
Aluminum c/lb. Duty 5¢/lb.	26	26	26	26	26	26	26	26	26	26	26	26
Nickel c/lb. Duty 3c/lb.												
Ingot	35	35	35	35	35	35	35	35	35	35	35	35
Shot	36	36	36	36	36	36	36	36	36	36	36	36
Electrolytic	39	39	39	39	39	39	39	39	39	39	39	39
Antimony (J & Ch) c/lb. Duty 2c/lb.	13.00	13.00	12.75	12.75	12.75	12.75	12.75	12.75	12.375	12.25	12.25	12.50
Silver c/oz. Troy Duty Free	55.75	56.125	56.25	56.25	56	56.125	56.125	56.00	56.125	56.125	55.875	55.875
Platinum \$/oz. Troy Duty Free	90	89	86	85	85	81	81	77	77	77	77	77
	14	15	16	17	18	19	20	21	22	23	24	25
Copper (f. o. b. Ref) c/lb. Duty Free												
Lake (Delivered)	13.125	13.00	13.00	12.875	12.75	12.75	12.625	12.625	12.50	12.75	13.125	12.625
Electrolytic	12.80	12.75	12.75	12.625	12.50	12.45	12.375	12.375	12.375	12.375	12.875	12.375
Casting	12.80	12.75	12.75	12.625	12.50	12.45	12.375	12.375	12.375	12.375	12.80	12.375
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb.												
Prime Western	6.05	6.05	6.05	6.075	6.075	6.025	6.00	6.00	6.10	6.15	6.00	6.088
Brass Special	6.075	6.10	6.10	6.125	6.125	6.075	6.05	6.05	6.15	6.20	6.05	6.140
Tin (f. o. b. N. Y.) c/lb. Duty Free												
Straits	67.50	67.25	67.75	67.75	68.00	68.00	67.00	67.00	67.00	67.00	68.50	67.524
Pig 99%	63.375	63.25	63.375	63.875	64.25	64.375	63.50	63.50	63.375	65.00	62.875	63.893
Lead (f. o. b. St. L.) c/lb. Duty 2¼c/lb.												
6.25	6.20	6.20	6.20	6.20	6.20	6.15	6.05	6.05	6.05	6.45	6.05	6.287
Aluminum c/lb. Duty 5¢/lb.	26	26	26	26	26	26	26	26	26	26	26	26
Nickel c/lb. Duty 3c/lb.												
Ingot	35	35	35	35	35	35	35	35	35	35	35	35
Shot	36	36	36	36	36	36	36	36	36	36	36	36
Electrolytic	39	39	39	39	39	39	39	39	39	39	39	39
Antimony (J & Ch) c/lb. Duty 2c/lb.	13.00	13.25	13.25	13.375	13.25	13.25	13.00	12.875	12.875	13.375	12.25	12.845
Silver c/oz. Troy Duty Free	55.875	56.25	56.375	56.375	57.00	57.25	56.625	56.625	57.00	57.25	55.75	56.274
Platinum \$/oz. Troy Duty Free	77	72	72	72	70	70	69	69	69	89	69	77.381

* Holiday.

Metal Prices, June 6, 1927

NEW METALS

Copper: Lake, 12.875. Electrolytic, 12.625. Casting, 12.50.
 Zinc: Prime Western, 6.25. Brass Special, 6.30.
 Tin: Straits, 68.00. Pig, 99%, 64.00.
 Lead: 6.20. Aluminum, 26.00. Antimony, 12.50.

Nickel: Ingot, 35. Shot, 36. Elec., 39. Pellets, 40.
 Quicksilver: flask, 75 lbs. \$121.00. Bismuth, \$2.20 to \$2.25.
 Cadmium, 60. Cobalt, 97%, \$2.60. Silver, oz., Troy, 57.125.
 Gold, oz., Troy, \$20.67. Platinum, oz., Troy, \$64.00.

INGOT METALS AND ALLOYS

Brass Ingots, Yellow	9 3/4 to 10 1/4%
Brass Ingots, Red	11 1/2 to 12
Bronze Ingots	12 1/2 to 13 1/2
Casting Aluminum Alloys	21 to 24
Manganese Bronze Castings	23 to 40
Manganese Bronze Ingots	12 to 16
Manganese Bronze Forging	32 to 40
Manganese Copper, 30%	25 to 35
Monel Metal Shot	28
Monel Metal Blocks	32
Parsons Manganese Bronze Ingots	18 1/4 to 19 1/4
Phosphor Bronze	13 1/2 to 15
Phosphor Copper, guaranteed 15%	18 to 22
Phosphor Copper, guaranteed, 10%	17 to 21
Phosphor Tin, guaranteed 5%	75 to 80
Phosphor Tin, no guarantee	70 to 80
Silicon Copper, 10%	28 to 32 according to quantity

OLD METALS

Buying Prices	Selling Prices
11 1/4 to 11 1/4 Heavy Cut Copper	12 3/4 to 13 1/4
10 3/4 to 11 1/4 Copper Wire	12 1/4 to 12 1/2
9 1/2 to 9 3/4 Light Copper	10 1/2 to 11
9 to 9 1/2 Heavy Machine Composition	10 to 10 1/4
7 1/2 to 7 3/4 Heavy Brass	8 3/4 to 9
6 1/2 to 6 1/2 Light Brass	7 1/2 to 7 3/4
7 3/4 to 7 1/2 No. 1 Yellow Brass Turnings	8 3/4 to 9 1/4
8 1/4 to 8 3/4 No. 1 Composition Turnings	9 3/4 to 10 1/4
6 1/2 to 6 1/2 Heavy Lead	7 1/2 to 7 3/4
4 1/2 to 4 1/2 Zinc Scrap	5 1/2 to 5 3/4
10 to 11 Scrap Aluminum Turnings	13 to 15
14 1/2 to 15 Scrap Aluminum, cast alloyed	18 to 19
20 to 20 1/2 Scrap Aluminum, sheet (new)	22 1/2 to 23
38 to 40 No. 1 Pewter	42 to 44
12 Old Nickel Anodes	14
18 Old Nickel	20

Wrought Metals and Alloys

COPPER SHEET

Mill shipments (hot rolled)	20 1/2 c. to 21 1/2 c. net base
From stock	21 1/2 c. to 22 1/2 c. net base

BARE COPPER WIRE

14 1/2 c. to 15 c. net base, in carload lots.

COPPER SEAMLESS TUBING

23 1/2 c. to 24 1/2 c. net base.

SOLDERING COPPERS

300 lbs. and over in one order .....	.20 c. net base
100 lbs. to 200 lbs. in one order	20 1/2 c. net base

ZINC SHEET

Duty sheet, 15%	Cents per lb.
Carload lots, standard sizes and gauges, at mill, less 8 per cent discount	9.75 net base
Casks, jobbers' price	10.50 net base
Open Casks, jobbers' price	11.00 to 11.25 net base

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga., base price	38c.
Aluminum coils, 24 ga., base price	34.7c.
Foreign	40c.

ROLLED NICKEL SHEET AND ROD

Net Base Prices

Cold Drawn Rods	53c.
Hot Rolled Rods	45c.

BLOCK TIN SHEET

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more 10 1/2 c. over Pig Tin; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 17c. over; less than 25 lbs., 25c. over.
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SILVER SHEET

Rolled sterling silver 57 1/2% to 59%.
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BRASS MATERIAL—MILL SHIPMENTS

In effect May 24, 1927

To customers who buy 5,000 lbs. or more in one order.

	Net base per lb.
High Brass	\$0.17 1/4
Low Brass	\$0.19 1/4
Bronze	\$0.21 1/4
Sheet .....	.18 1/4
Wire .....	.19 1/4
Rod .....	.20
Brazed tubing .....	.25 1/4
Open seam tubing .....	.25 1/4
Angles and channels .....	.28 1/4

For less than 5,000 lbs. add 1c. per lb. to above prices.

BRASS SEAMLESS TUBING

22 1/2 c. to 23 1/2 c. net base.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod	19 1/4 c. net base
Muntz or Yellow Metal Sheathing (14" x 48")	17 1/4 c. net base
Muntz or Yellow Rectangular sheet other Sheathing	18 1/4 c. net base
Muntz or Yellow Metal Rod	15 1/4 c. net base
Above are for 100 lbs. or more in one order.	

NICKEL SILVER (NICKELENE)

Net Base Prices	
Grade "A" Sheet Metal	Wire and Rod
10% Quality	25 1/2 c. 10% Quality
15% "	27 1/2 c. 15% "
18% "	28 1/2 c. 18% "

MONEL METAL SHEET AND ROD

Hot Rolled Rods (base)	35
Cold Drawn Rods (base)	43

BRITANNIA METAL SHEET

No. 1 Britannia—18" wide or less, No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin price; 100 lbs. to 500 lbs., 10c. over; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 20c. over; less than 25 lbs., 25c. over. Prices f. o. b. mill.

Supply Prices, June 6, 1927

ANODES

Copper:	Cast	19 $\frac{1}{2}$ c. per lb.
	Rolled	19 $\frac{1}{2}$ c. per lb.
	Electrolytic	20c. per lb.
Brass:	Cast	18 $\frac{1}{2}$ c. per lb.
	Rolled	19 $\frac{1}{2}$ c. per lb.
Zinc:	Cast	13c. per lb.

Nickel:	90-92%	45c. per lb.
	95-97%	47c. per lb.
	99%	49c. per lb.
Silver:	Rolled silver anodes .999 fine are quoted from 59 $\frac{1}{2}$ c. to 61 $\frac{1}{2}$ c. Troy ounce, depending upon quantity purchase.	

FELT POLISHING WHEELS WHITE SPANISH

Diameter	Thickness	Under 100 lbs.	100 to 200 lbs.	Over 200 lbs.
10-12-14 & 16"	1" to 3"	\$3.00/lb.	\$2.75/lb.	\$2.65/lb.
6-8 & over 16	1 to 3	3.10	2.85	2.75
6 to 24	Under $\frac{1}{2}$	4.25	4.00	3.90
6 to 24	$\frac{1}{4}$ to 1	4.00	3.75	3.65
6 to 24	Over 3	3.40	3.15	3.05
4 up to 6	$\frac{1}{4}$ to 3	4.85	4.85	4.85
4 up to 6	Over 3	5.25	5.25	5.25
Under 4	$\frac{1}{4}$ to 3	5.45	5.45	5.45
Under 4	Over 3	5.85	5.85	5.85

Grey Mexican Wheel deduct 10c per lb. from White Spanish prices.

COTTON BUFFS

Full Disc Open buffs, per 100 sections.	
12" 20 ply 64/68 Unbleached	..... \$27.65-28.85
14" 20 ply 64/68 Unbleached	..... 35.55-35.90
12" 20 ply 80/92 Unbleached	..... 29.50
14" 20 ply 80/92 Unbleached	..... 40.00
12" 20 ply 84/92 Unbleached	..... 34.25-40.50
14" 20 ply 84/92 Unbleached	..... 46.40-54.20
12" 20 ply 80/84 Unbleached	..... 36.50-37.15
14" 20 ply 80/84 Unbleached	..... 49.15-50.40

Sewed Pieced Buffs, per lb., bleached 60-75c.

CHEMICALS

These are manufacturers' quantity prices	
Acetone	lb. .11-16
Acid—Boric (Boracic) Crystals	lb. .12
Chromic	lb. .32
Hydrochloric (Muriatic) Tech., 20°, CarLoys	lb. .02
Hydrochloric, C. P., 20 deg., carboys	lb. .06
Hydrofluoric, 30%, bbls.	lb. .08
Nitric, 36 deg., carboys	lb. .06
Nitric, 42 deg., carboys	lb. .07
Sulphuric, 66 deg., carboys	lb. .02
Alcohol—Butyl	lb. 18 $\frac{1}{4}$ -22 $\frac{1}{4}$
Denatured, bbls.	gal. .54
Alum—Lump, Barrels	lb. .03 $\frac{1}{4}$
Powdered, Barrels	lb. .042
Aluminum sulphate, commercial tech.	lb. .02 $\frac{1}{2}$
Aluminum chloride solution in carboys	lb. .06 $\frac{1}{2}$
Ammonium—Sulphate, tech, bbls.	lb. .03 $\frac{1}{4}$
Sulphocyanide	lb.
Arsenic, white, kegs	lb. .05
Asphaltum	lb. .35
Benzol, pure	gal. .60
Borax Crystals (Sodium Borate), bbls.	lb. .04 $\frac{1}{2}$
Calcium Carbonate (Precipitated Chalk)	lb.
Carbon Bisulphide, Drums	lb.
Chrome Green, bbls.	lb. .29
Chromic Sulphate	lb. .37
Copper—Acetate (Verdegris)	lb. .37
Carbonate, bbls.	lb. .17
Cyanide (100 lb. kegs)	lb. .50
Sulphate, bbls.	lb. .05 $\frac{1}{2}$
Cream of Tartar Crystals (Potassium bitartrate)	lb.
Crocus	lb. .15
Dextrin	lb. .05-08
Emery Flour	lb. .06
Flint, powdered	ton \$30.00
Flour-spar (Calcic flouride)	ton \$75.00
Fusel Oil	gal. \$4.45
Gold Chloride	oz. \$14.00
Gum—Sandarac	lb. .26
Shellac	lb. .59-.61

and Fased on delivery from New York City.	
Iron, Sulphate (Copperas), bbl.	lb. .01 $\frac{1}{2}$
Lead Acetate (Sugar of Lead)	lb. .13 $\frac{1}{4}$
Yellow Oxide (Litharge)	lb. .12 $\frac{1}{2}$
Mercury Bichloride (Corrosive Sublimate)	lb. \$1.58
Nickel—Carbonate dry, bbls.	lb. .29
Chloride, bbls.	lb. .17-.18
Salts, single 300 lb. bbls.	lb. .10 $\frac{1}{2}$
Salts, double 425 lb. bbls.	lb. .10
Paraffin	lb. .05-.06
Phosphorus—Duty free, according to quantity	.... 35-40
Potash, Caustic Electrolytic 88-92% broken, drums	lb. .09 $\frac{1}{4}$
Potassium Bichromate, casks (crystals)	lb. .08 $\frac{1}{2}$
Carbonate, 96-98%	lb. .07
Cyanide, 165 lb. cases, 94-96%	lb. .57 $\frac{1}{2}$
Pumice, ground, bbls.	lb. .02 $\frac{1}{2}$
Quartz, powdered	ton \$30.00
Rosin, bbls.	lb. .04 $\frac{1}{2}$
Rouge, nickel, 100 lb. lots	lb. .25
Silver and Gold	lb. .65
Sal Ammoniac (Ammonium Chloride) in casks	lb. .06
Silver Chloride, dry	oz. .86
Cyanide (fluctuating)	oz. .00
Nitrate, 100 ounce lbs	oz. 40 $\frac{1}{2}$
Soda Ash, 58%, bbls.	lb. .02 $\frac{1}{2}$
Sodium—Cyanide, 96 to 98%, 100 lbs.	lb. .20
Hyposulphite, kegs	lb. .04
Nitrate, tech., bbls.	lb. .04 $\frac{1}{4}$
Phosphate, tech., bbls.	lb. .03 $\frac{1}{4}$
Silicate (Water Glass), bbls.	lb. .02
Sulpho Cyanide	lb. .45
Sulphur (Brimstone), bbls.	lb. .02
Tin Chloride, 100 lb. kegs	lb. .47
Tripoli, Powdered	lb. .03
Wax—Bees, white ref. bleached	lb. .60
Yellow, No. 1	lb. .45
Whiting, Bolted	lb. .02 $\frac{1}{2}$ -00
Zinc, Carbonate, bbls.	lb. .11-.12
Chloride, casks	lb. .06 $\frac{1}{4}$
Cyanide (100 lb. kegs)	lb. .41
Sulphate, bbls.	lb. .03 $\frac{1}{4}$